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Improved Portable Steam Brick Machine.

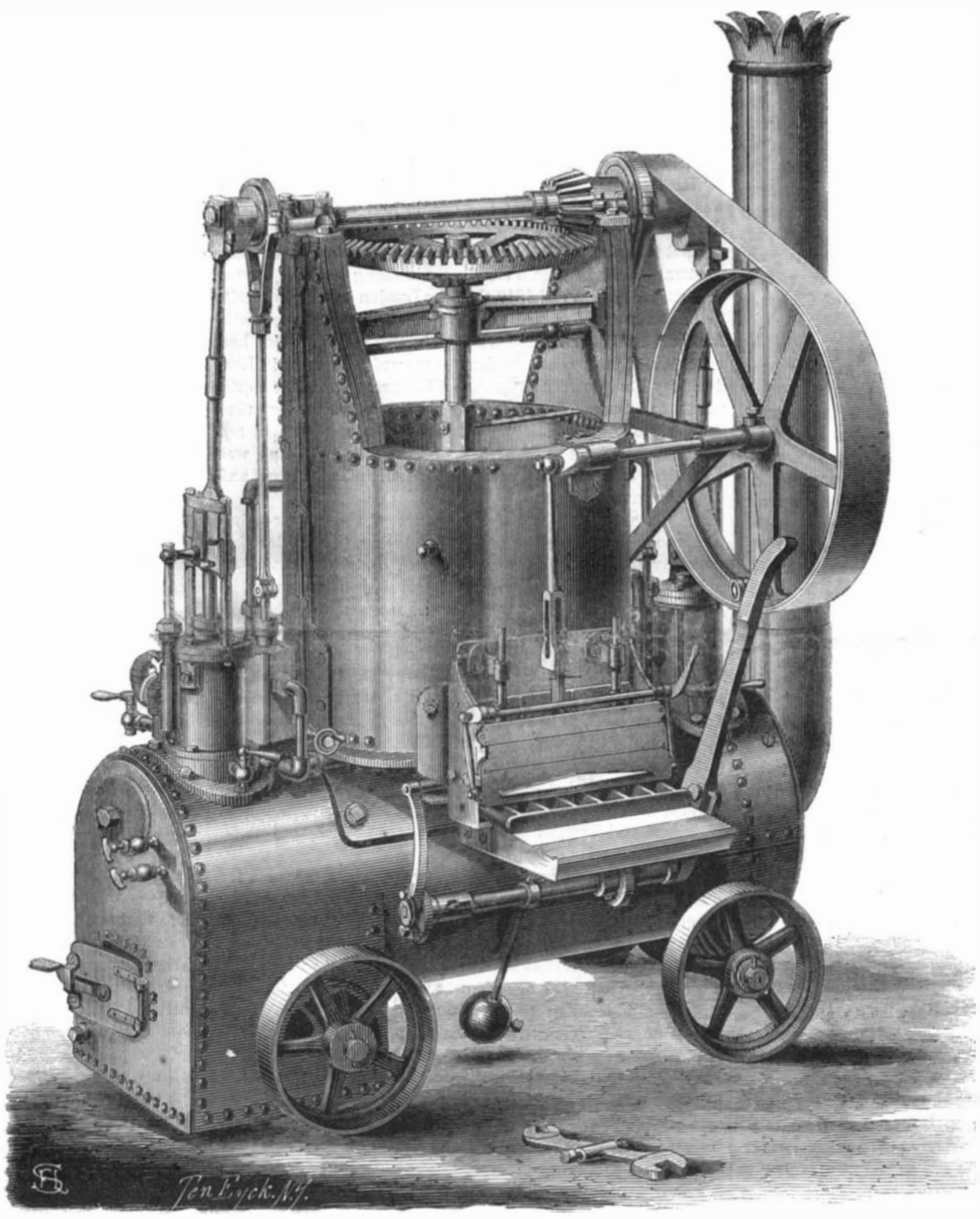
To successfully manufacture bricks, a full recognition of the chemical, as well as the mechanical character of the process, is necessary. The clays employed for this purpose vary greatly in character; not only in different beds, but in the same bed, much difference in quality is often met with at different depths. Without at this time entering into details, it is perhaps safe to say that most of the failures in methods adopted with a view to produce better and cheaper bricks than those made by the original method have arisen from subordinating the chemical principles involved to the mechanical part of production.

To produce a smooth, even, and regular surface, to turn out bricks rapidly, to avoid the necessity of hacking, and to give the bricks sharp and clear-cut angles, amount simply to nothing, if the other essentials of good bricks are wanting. The principal essentials of good bricks are that they should, in addition to the qualities above enumerated, not crack or fall in the kiln, not be liable to break and crumble in handling or in transportation, that they should be uniform in quality, not only throughout the body of individual bricks, but approximately so throughout all those made from the same material, that they should not be difficult to cut with the trowel, nor liable to disintegration from the action of the weather.

It needs no argument to prove that a machine, no matter how perfect and beautiful it delivers the bricks, is—if in its operation it so influences the subsequent process of drying and burning that these can only be done imperfectly—worse than useless. Such, unfortunately, has been the effect of many costly machines, which have had their day.

The fact, however, that so many worthless devices have been tried, and that, while there have been many failures and few successes, brick makers are still anxious to try new devices in the hope of getting the right thing at last, shows the importance of a machine that answers all the conditions required.

Such a machine it is claimed is the one which we this week present to the consideration of our readers, and which is illustrated in our engraving.



WINN'S PORTABLE STEAM BRICK MACHINE.

The machine is a steam-boiler, engine, and brick machine combined, the whole made portable by being constructed upon wheels, and can be easily moved upon a track. The machine is constructed entirely of iron, and in the most substantial and durable manner. The clay mill, to which is attached the pressing or molding arrangement, is placed upon the boiler, and at each side of it are two engines or steam cylinders, of 8-in. bore by 14-in. stroke, running 40 revolutions per minute.

The capacity of the boiler is 20-horse power. The clay mill, in which the clay is ground and tempered, is built of heavy boiler-plate iron, of the same quality as the boiler, and is of cylindrical form, constructed with two shells or walls, with an annular chamber between the two shells of two and three fourths inches space. This space contains a coiled pipe, through which steam circulates and heats the water which occupies the annular chamber, and used in supplying the boiler as well as in tempering clay. By this arrangement the boiler is supplied with hot feed water, and the clay is regularly and evenly tempered, the water for the purpose being taken from the annular chamber above the clay, inside the mill, by means of a perforated horizontal pipe extending over it, and the supply regulated by a cock which is adjusted by the pit shovelers.

There is also an arrangement for tempering the clay by steam direct from the boiler, by which it is claimed most clays may be thoroughly tempered without previously soaking in a pit.

Two perforated pipes, passing through the clay mill direct from the boiler, admit high-pressure steam. This steam is condensed by the colder clay which absorbs the water produced by condensation and the latent heat of the steam given off while condensing, so that the clay becomes thoroughly wetted as well as uniformly heated. The bricks are delivered from the molds hot. Of course they dry much more rapidly than could be the case with cold-molded bricks; 50 per cent being the saving in this respect claimed over any other processs, attained without the expense of fuel and fixtures required in other artificial methods of drying.

Besides being advantageous in working tenacious clays, the use of steam is particularly beneficial in winter. It is claimed that by its use the manufacture may progress as profitably in winter as in summer, provided a market for the bricks can be secured. The steam extracts all the frost from the clay, and the bricks are laid on the floor at a higher temperature than can be attained by the expensive method of arches and flues with superimposed floors; the bricks in cooling becoming so dry that they are no longer liable to injury from frost.

In good weather, when the yard is in good drying condition, there is no particular advantage in tempering with steam, and the cock may be closed; but in cloudy, misty weather, when the yard is damp, or from any other cause the drying of the bricks is too slow, the steam is turned on and the water partially shut off, and the clay is heated as much or as little as desired. Or, if the clay is tough and tenacious and does not properly temper, the steam is used. For making brick during the winter season, the use of the steam is indispensable, and the bricks may be delivered from the molds or machine at any temperature desired up to 212 degrees.

The advantages claimed for this machine may be summed up as follows:

It is combined with its own motive power. It is portable, and requires no foundation other than two sticks of timber, which serve as a simple temporary track for the wheels. It can be set in operation in twenty minutes. It is both powerful and durable, made of the best iron and in the most workmanlike manner. Each part and movement is adjustable, and the pressure may be instantly regulated and changed without stopping any of its moving parts. It cannot be broken by any stones or sticks, whether they are in the clay by accident or design. It is extremely rapid in its work. It may be used for motive power applied to other purposes when not used for making bricks. It is further claimed to be the cheapest machine of any now used in the United States, and driven by steam power, both as regards original cost and the maintenance of repairs.

Patented, through the Scientific American Patent Agency, June 2, 1868, by C. A. Winn, whom address for further information, at Lock Haven, Pa.

Work for Women.

We learn that a novel institution for women is to be opened in the neighborhood of Boston, as soon as the requisite funds are obtained. It is to be a horticultural school, and is designed not as a charitable institution, but a high-class school where thorough instruction in horticulture will be given to young women for such compensation as will, in the end, make it self-supporting, or nearly so.

The working plan of the school comprises a farm, to be procured in the vicinity of Boston, containing about twenty acres, five acres to be used for the cultivation of small fruits, flowers, salads, and such vegetables as are suitable for culture by female labor, the rest to be devoted to mowing and pasturage; a good plain dwelling house capable of accommodating about thirty inmates; a barn large enough for the farm stock, and an experimental plant house for growing flowers and early vegetables, and the forwarding of plants for field crops. The control of the institution is to be vested in a president, secretary, treasurer, and twenty-four managers—one half of whom will be ladies—who will be aided by a competent instructor, an experienced farmer, and the necessary assistants. The pupils will be instructed in plain sewing, the use of the sewing machine, and in all kinds of housework, as well as in horticulture; and lecturers and teachers in kindred branches of labor and service will be employed from time to time.

It is intended to receive pupils to the number of twenty-five, who are from the age of sixteen upward, of good character, fair education, and able to work as may be required. The course of instruction will extend through two years. The estimated cost of procuring the farm and outbuildings and maintaining the school for three years, is $30,000.

NO MORE SHEARING OF PLATES.—By means of their patent "Universal Mill" the Union Iron Mills, of Pittsburgh (branch office 19 Broad Street, New York,) are enabled to furnish plates, with the edges formed, by the action of vertical rolls, remarkably straight, solid and uniform throughout, so that no re-shearing is necessary, even when great exactness is required. Workers in iron will do well to give this improvement a trial, as the prices are said to be as low as for plates manufactured in the ordinary manner.

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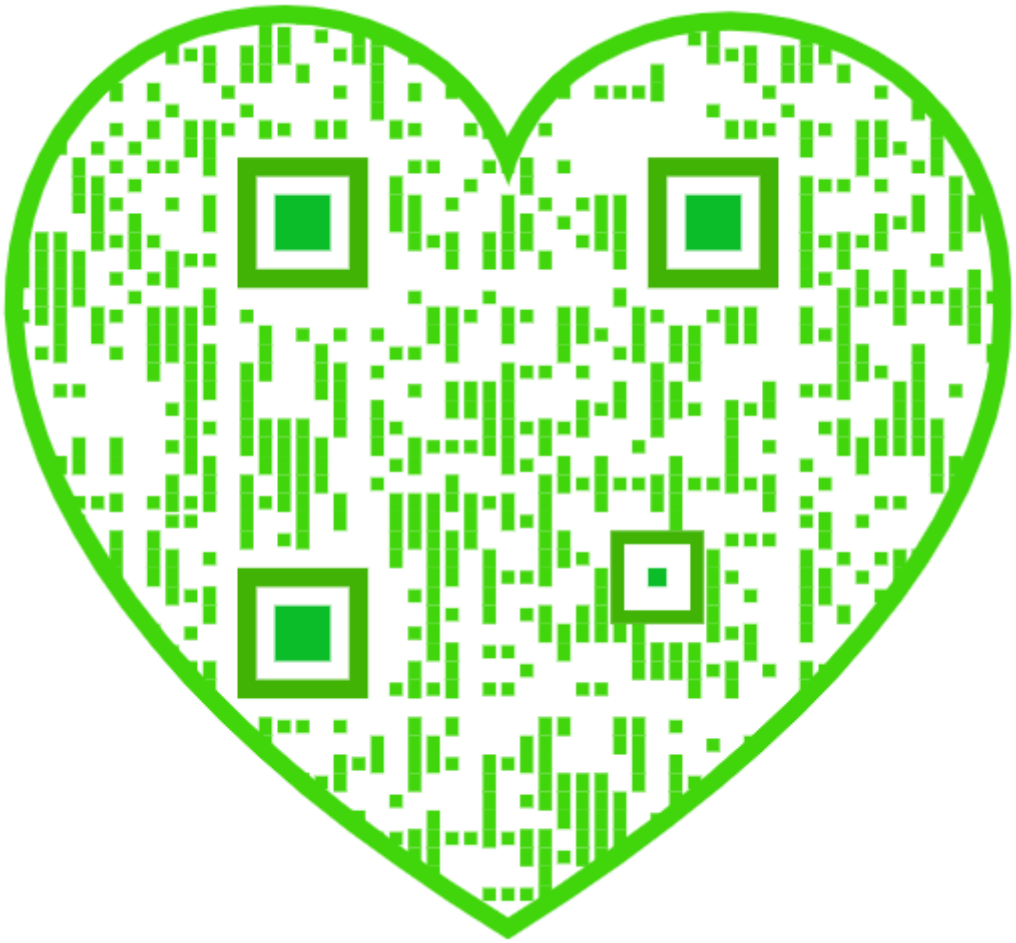

TERRESTRIAL MAGNETISM.

From Chambers' Journal.

One of those periods is now approaching when the earth thrilled through her whole frame by magnetic throes of unusual intensity. Physicists will be able to trace in the lent indications of the suspended magnet the action of the ost remarkable of all the forces to which the earth is subcted. In telegraphic offices, the occurrence of these disrbance will be made apparent by the interruption of comunication for longer or shorter intervals of time. And the lf-recording instruments at Kew and other such observaries will indicate by unusual movements the progress of ose mysterious electric convulsions known as magnetic orms. But except for such indications as these, and one or vo others which have only of late years been referred to the rency of terrestrial magnetism, the inhabitants of this earth ll not be made sensibly aware that anything unusual is in rogress. For ages these magnetic disturbances have thrilled rough the earth's framework without being recognized; nd even now it seems almost by an accident that our physists have been led to understand the significance of one of ie most remarkable of all terrestrial phenomena.

The facts which have been ascertained respecting terrestrial agnetism are so interesting and so little known, that we ay confidently claim the attention of the reader while we ate some of the most striking and noteworthy of them.

The most generally recognized property of the magnet, its ower of indicating the north point, was discovered by the hinese many ages before it became known to European obervers. We learn that the Chinese, when journeying over ie great plains of Central Asia, used a magnetic car, in front which a floating needle bore a figure, whose outstretched m pointed continually southwards. The Greeks and Romans were aware that iron could be magnetized: but it never appened that a suitably balanced fragment of magnetized on exhibited to them the earth's directive force. Humboldt emarks that "on this accidental circumstance alone the great iscovery depended." It must be remarked, however, that uch accidents have been common in the history of discovery nd invention.

Had the western nations discovered the magnet's principal roperty so early as the Chinese, we should probably have ained valuable information respecting the next property hich has to be considered—the fact, namely, that the magt do s not commonly point due north. It is not likely that ie Chinese discovered this property, because over the whole f Eastern Asia the magnetic compass points very nearly owards the north. But even if they had, it is not so much ie divergence of the compass from the north point which ould have rendered the discovery interesting to us, as the nowledge which ancient observations might have given us especting the laws on which the *changes* of that divergence epend. In Europe, as we shall presently see, these changes re very conspicuous.

It was in the thirteenth century that European observers rst detected the fact that the magnetic needle does not point ue north. It may be well to notice a certain peculiarity bout the nomenclature of this deviation. Seamen always all it the needle's *variation;* but among scientific men it is alled the *declination*. For a long time it was supposed that ie direction of the needle was the same for all places; but uring the first voyage of Christopher Columbus across the tlantic it was found that this is not the case. He had travled six hundred miles from the most westerly of the Canary slands, when he noticed that the compass, which had been ointing towards the east of north when he was in Europe, as now pointing due north. The actual day on which the is overy was made was September 13, 1492. As he sailed rther west he found that the westerly declination gradually ncreased.

But here we have at once to call attention to another peuliarity of the magnetic compass, otherwise the reader would orm a mistaken notion of the present nature of the needle's eclination. We have spoken of the needle as pointing to he east of north in 1492. This is no longer a true descripion of the declination in Europe. The needle now points far o the west of north. It is a peculiarity of the science of terestrial magnetism that variations are thus mixed up with ariations, until it has become a matter of exceeding difficulty o present all the facts of the science in such a sequence that he student shall not be in any risk of being led astray. roperly speaking, the change of the needle's declination om time to time should be kept wholly separate from the hanges which are noticed as the needle is changed from lace to place. Yet, if this were done in describing the origaal discovery of the latter change, erroneous impressions ould be given respecting the present state of the needle's eclination in various countries.

At present, the terrestrial globe may be looked upon as ivided into two vast but unequal portions, which may be alled the region of westerly magnets and the region of eastrly magnets. In the former must be included all Europe, xcept the extreme north-easterly parts of Russia, the whole f Africa, Turkey, Arabia, the greater part of the Indian cean, and the western parts of Australia. Returning westvards, we must add to the region of westerly magnets the reater part of the Atlantic Ocean, the north-eastern parts of Brazil, the eastern parts of Canada, and the whole of Greenand. All the rest of the world belongs to the region of asterly magnets except an oval space, which is situated in he very middle of the region, yet has a contrary character. his space includes the eastern part of China, Manchooria, nd the islands of Japan.

Such is the present arrangement of the two divisions; but ifty years ago, the description would have been incorrect, and fifty years hence it will again be so; for over the whole world the declination is steadily changing—here in one direction; there in the contrary; quickly at some places, almost imperceptibly at others. And we may mention in passing, that, as a general rule, where the declination is least either westward or eastward, there it is changing most rapidly; and where it is greatest, it is hardly changing at all. But there appear to be some places where the range of change is so small, that, though the declination is never large, it does not change rapidly—as in other places of small declination. As yet, however, much remains to be learned respecting the progress of these strange changes in countries where magnetic observations have been only commenced in recent times.

Some idea of the complexity of the question will be suggested by comparing the changes which have occurred in two places so near to each other as London and Paris. We shall see that not only are the declinations different in these cities, but their range of variation is different, both as to extent and as to the period in which a complete oscillation of the needle is effected.

The easterly declination of the needle in London was observed to disappear in about the year 1657. From that epoch, the needle continually traveled westwards, until it began to be thought that it would move ever in that direction, and so come at length to point southwards. In Paris, the easterly declination had not disappeared before the year 1663, and there also the needle traveled continually westwards, though not quite so rapidly as in London. In 1814, the needle pointed about 22½ degrees towards the west in Paris, and some two degrees further west in London. In that year, however, Arago startled the scientific world by announcing that in his opinion the needle's westerly motion was flagging, and he asserted his belief that that motion would presently give place to an easterly movement. Only three years passed before the prediction was fulfilled; and on the 10th of April, 1817, Arago was able to announce that the needle had begun to return towards the north. But observers in London pronounced against this view. The London needles were still traveling westward, though with a slowly diminishing motion. It was not until the spring of 1819 that the London observers admitted that the needles had really reached the limit of their westerly oscillation. And whereas in Paris the needles had not traveled more than 22½ degrees towards the west, in London they had passed no less than 25 degrees from the north point. Corresponding to this circumstance, we see also that the duration of the half-oscillation (for the needles had not been watched from their greatest easterly declinations) was a hundred and sixty-two years in London, and a hundred and fifty-four years in Paris.

It gives a grand idea of the nature of those ever-acting forces to which terrestrial magnetism is due, to consider that the sway of the magnetic needle from limit to limit of its range should occupy so long an interval as three centuries in both these instances. Conceive the scale on which a pendulum should be constructed in order that its oscillations might have a period of as many seconds!

It was while they were engaged in tracking the progress of this long oscillation, that physicists detected minute oscillations superposed, so to speak, upon the main one, and even more singular in their character. The case is somewhat as though to the bob of a long pendulum there were attached a short one, and that it was to the motions of this short pendulum (beating with its own rapid swing, while carried slowly backward and forward by the main movement) that attention was primarily directed.

Each day the magnetic needle sways backward and forward *twice* across its mean position. Shortly before midnight, it begins to travel from west to east, reaching the limit of that motion soon after eight in the morning. Then it sweeps westward to its greatest westerly limit, which it reaches soon after one. Then back again towards the east, until half-past eight, and so to its original position at about eleven o'clock.

It must be understood that these motions are so minute in comparison with the great secular oscillation, that they never affect the general direction of the magnet to any noteworthy extent. For instance, we have just spoken of the two easterly limits of the daily swing, but throughout the day the magnet always points far to the west of north. The mean declination, in fact, is (roughly) about 20 degrees, whereas the daily swing never ranges over more than the fifth part of a degree.

It will be noticed that the oscillations above described correspond closely with the diurnal motions of the sun. They are such, in fact, as the needle would exhibit on the supposition that it tries to follow the sun during his complete apparent revolution round the celestial sphere. It is believed that the daily motions of flowers, and in particular that class of motion which has given the sun-flower its distinctive appellation, are due to the same magnetic properties which cause the diurnal swing of the suspended needle.

But besides the daily sway of the magnetic needle, there is an annual oscillation of a somewhar different character. In fact, properly speaking, the annual change is not oscillatory, though it has a regularly recurrent character. The daily swing is variable. Now this variability would be somewhat confusing, on account of its general irregularity; therefore, physicists consider the mean of several days, and thus get rid of what for the present we may term accidental variations. When this has been done, it is found that the average daily swing of the needle is subject to a slow progressive increase, followed by an equally slow diminution; and the period of these slow changes is a year.

The peculiarity of this annual change is that its progress is the same for both hemispheres. It might have been expected that it would attain its maximum in summer, when the solar influence is strongest; but this is not the case. It attains its maximum in January, which is indeed near midsummer for the southern hemisphere, but nearly the least sunny of our northern months. The secret of this peculiarity lies in the fact that the sun is nearest to the earth in January. The peculiarity is a very meaning one, as showing that the magnetic influence is not a local matter, however variable the magnetic declination may be as we shift from place to place. The real fact pointed to by this, as by many other phenomena, is, that the earth must be looked upon as a single gigantic magnet, gaining or losing power throughout its whole frame simultaneously.

The consideration of the *power* of the great earth-magnet must be for a moment laid on one side, while we deal with a form of deviation as remarkable as the declination. We refer to the *dip* of the needle. The ordinary compass is, we know, suspended horizontally, and, for anything which appears to the contrary when we examine such an instrument, that might be the needle's position of rest. But when a needle is so suspended by a silken thread as to be free to assume an inclined position, it is found that the northern end dips perceptibly. We are assuming, of course, that in its non-magnetized state the needle would rest horizontally. In our latitudes, the dip or inclination is so great that the needle is inclined only about 22 degrees to the vertical. When we travel northwards, the dip increases; when southwards, it diminishes, until we reach a place near the equator (traveling always, it is assumed, in the longitude of London) where the needle becomes horizontal. After passing that point, the southern end dips, and the inclination continues to increase as we travel southwards.

The same is true for other longitudes, only the place of "no dip" is differently situated. The line along which there is no inclination lies near the equator, crossing that circle at two opposite points, one in west longitude 3 degrees, the other in east longitude 177 degrees. The magnetic equator is not a strictly circular curve, however; it is noteworthy that it departs most from the figure of a true circle where it traverses the Atlantic Ocean.

We have seen the variations which are exhibited in the declination of the magnet, not only at different places, but at different times in the same place. Changes of precisely the same character are exhibited in the dip of the magnet; in London, for example, the dip has diminished four degrees in less than a century; in Paris, during the last two centuries, the dip has diminished about seven degrees.

Seeing this, we must accept with some little question the locales usually assigned to the magnetic poles; because we have every reason for supposing that these poles must be continually shifting their position. In fact, the motion of the magnetic equator, which is continually sweeping from east to west along the true equator, suffices of itself to demonstrate that the magnetic poles are continually traveling around the true poles. What the laws of this motion may be, it would not be easy to determine in the present state of our knowledge; but it is worthy of notice that the same motion would serve to account at once for the change of dip and the change of declination. For example, in 1663 the magnetic pole may be reasonably supposed to have been due north of Paris. In the latter year, the inclination was 75 degrees in Paris, so that we can judge that the magnetic pole was on the nearer side of the true pole. As the magnetic pole passed away from this position, traveling westward, there would naturally result both a westerly declination and a gradual diminution of dip. And the fact that when Sir J. C. Ross determined the position of the northern pole in 1837, it was found to be somewhat more than 90 degrees west of the longitude of Paris—in other words, the fact that it had traversed somewhat more than a quarter of a complete revolution soon after the westerly declination at Paris had attained its maximum value—seems strikingly confirmatory of this view. If this theory is correct, the inclination will continue to diminish until the magnetic pole has completed half a revolution, so as to be again due north of Paris, but on the further side of the true pole. Then the declination will be nothing, and it will afterwards become easterly.

It must be admitted, however, that there is much more complexity in the laws according to which the declination varies, than the above view, taken alone would imply. Doubtless, the peculiarities of the earth's structure, the arrangement of land and water, mountain-ranges, table-lands, and valleys, have much to do with the matter.

The variations of the intensity of magnetic action, either from time to time, or as we proceed from place to place, are among the most interesting of all the phenomena of terrestrial magnetism. The latter class of change is associated so obviously with the changes of declination and dip, that we need not enter on its consideration. The former, however, points to problems of extreme interest in connection with the probable character and source of the whole range of forces included under the subject we are dealing with.

We have seen already that from hour to hour, and from day to day, there are changes in the extent of the minute oscillations of the suspended magnet, and that these changes indicate variations in the intensity of the magnetic force under diurnal and annual solar influences. When we add to these variations a change which has a period corresponding to the motions of the moon, it becomes evident that it is to an influence as subtile and as prevading in its character as gravitation itself, that the terrestrial magnet owes its powers.

But there are other variations still more significant.

A long series of researches had convinced Colonel Sabine, one of our leading authorities on the subject of terrestrial magnetism, that the intensity of the magnetic action is subject to a process of change having a period of somewhat more than ten years. Scarcely had this law been established, when the results of a long and elaborate series of solar observations

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exhibited to the world the strange fact, that the spots which stain the sun's face vary in frequency according to a precisely similar relation. It was found that the changes of solar spottiness, and of magnetic intensity of action, are not merely characterized by an equality of period, but that the maximum effect under one period is absolutely coincident with the maximum effect under the other.

We might have looked upon this as merely a very singular coincidence, had we not independent evidence of an association between the sun's action and the intensity of terrestrial magnetism. Part of this evidence has been already referred to. But the evidence founded on the exact coincidence of magnetic storms, thrilling in a moment through the whole frame of the earth, with solar disturbances actually witnessed by astronomical observers, is even more striking. Thus, no room is left to question the dependence of terrestrial magnetism on solar action, and the relation between the sun's spots and the vibrations of the needle—a relation which, when first propounded, was received even by eminent physicists with ridicule—has been accepted as one of the most well established of all the circumstances known respecting terrestrial magnetism. Of the meaning of this singular relation, we have not at present space to speak; indeed, we should be led into a variety of considerations, which would be out of place in such a paper as the present. The appearance presented by the solar spots, the processes by which they are formed, the laws on which their changes depend—all these, and many other questions of the sort would have to be dealt with, to say nothing of the planetary movements on which, according to modern researches, the habitudes of the solar atmosphere are dependent. We may note, in conclusion, that the solar face has recently presented all the signs which we have learned to associate with the intenser phases of terrestrial magnetic action. Enormous spots and clusters of spots have broken out during the past few months; and probably the spots which will shortly make their appearance will be yet larger, since the epoch of maximum disturbance has not yet been fully reached.

THE MANUFACTURE OF SULPHURIC ACID.

From the Report of J. Lawrence Smith, United States Commissioner to Paris Exposition.

Combustion of Pyrites Compared with that of Sulphur.—It is found, in making sulphuric acid from pyrites, that larger chambers are required, and a larger quantity of niter in proportion to the sulphur burnt, than when sulphur is used. This arises from the higher temperature of the vapor from the pyrites, and from the greater quantity of inert gas that circulates through the apparatus. Too much attention cannot be given to diminishing the temperature of the gases, but in most works it is neglected; some, however, pass the gases through a kind of tubular boiler of lead surrounded by water, and thus cool down the vapors before they enter the chamber. Another precaution to be observed is, not to let the lump pyrites exceed the size of an egg, and to free it from fine matter that would clog the openings. There is very convenient machinery devised that will answer this purpose very well.

The little loss by the augmentation of inert gas in the chamber where pyrites is used may be diminished by determining, by frequent analyses, the proportion of sulphurous acid introduced into the chamber, a method now slowly growing into use; tests being made with a solution, *titrée*, of iodine, colored by starch. The gas is drawn from the chamber by means of an aspirator, and the water flowing from the aspirator is measured in a graduated vessel, which gives the bulk of the inert gases mixed with the sulphurous acid. This last is absorbed and calculated from the iodine solution through which the gases are made to pass. The mean of these analyses gives nine per cent of sulphurous acid, which, according to the composition of the air and pyrites, ought to be mixed with 79 of nitrogen and 8½ of oxygen. This method of testing is well adapted to chambers where nitric acid is used or having nitrification furnaces constructed at the base of the chambers; but this testing can be used for all chambers at the exit, where the gases commonly contain six per cent of oxygen. It would be well to diminish this quantity, taking care, however, that the oxygen does not disappear entirely, as this is a guarantee against the loss of binoxide of nitrogen, which is not absorbable by the cascade of sulphuric acid of Gay Lussac, when the proprietors of works are prudent enough to use his method of preventing loss of nitrous vapors.

Proper manipulation of the pyrites method depends on the nature of the combustion of the pyrites and the regulation of the draft of air. When the furnaces are well constructed with this in view, there can be obtained 126 parts of sulphuric acid for 100 parts of pyrites of 45 per cent of sulphur, thereby utilizing as much as 42 per cent of the sulphur. There is no greater drawback to this method of making sulphuric acid than the admission of too much air.

Oxidation of Sulphurous Acid by Nitrous Acid Vapors.—The compounds of nitrogen and oxygen are used as agents to complete the oxidation of the sulphurous acid by a reaction familiar to chemists. The introduction of the nitrous vapors into the lead chambers is carried on in several ways in Kuhlmann's large works at Lille, and in other factories in France a small stream of nitric acid is allowed to flow into the nitrification chamber, the size of the stream being regulated so as to furnish the proper proportion where it reacts on the sulphurous acid at a comparatively low temperature. It is a good process, and may be regarded as a more natural process than any other in supplying the nitrous vapors. The acid is allowed to enter into the first chamber in a small stream; it is made to strike on glass gutters, or a stone-ware vessel, in such a manner that the liquid acid is divided into spray. As this falls into the chamber, and comes in contact with the sulphurous acid, it only furnishes the useful nitrous products, there being no formation of protoxide of nitrogen, or nitrogen, as sometimes happens from a rapid action on the niter pans, as when they are carelessly heated red-hot. The operation is very regular, and the economy in nitric acid more than compensates for the expense of first forming the nitric acid.

The more common process is by the action of sulphuric acid on nitrate of soda, and passing the vapors thus produced into the lead chambers. The method usually employed in England is the best for carrying out this decomposition, it being carried on in one instead of several vessels, and placing the vessel very near the entrance into the lead chambers. The quatitity of nitrate of soda used by the several manufacturers for every 100 parts of sulphur, as stated by C. R. Wright, is

For pyrites containing 45 to 50 per cent sulphur	8·5 per cent.
For pyrites containing 30 to 50 per cent sulphur	12·0 per cent.
For pyrites containing 35 average per cent sulphur	12·5 per cent.
For pure sulphur	10·0 per cent.

Efforts to Produce Sulphuric Acid without the Agency of Nitric Acid or Nitrous Vapor.—Several methods have been proposed, but no one of them has proved successful. Tennant Dunlap has approximated to success by a method which is in use, whereby, having once produced the requisite supply of nitrous vapors no more are required except to make up the unavoidable loss. As this process is not familiar to most of our manufacturers, it will here be described, although it has been in successful operation for several years in the gigantic chemical works of C. Tennant & Co. Instead of treating nitrate of soda with sulphuric acid, and employing the nitric thus obtained, a mixture of nitrate of soda and of chloride of sodium is decomposed, which yields, together with sulphate of soda, chlorine gas and nitrous acid. These gases are separated by passing them through concentrated sulphuric acid of not less than 1·75 sp. gr., when the nitrous acid is absorbed, the chlorine being utilized for the production of chloride of lime. The sulphuric solution of nitrous acid is allowed to flow into the chambers, where, by appropriate apparatus, it is brought into contact with water, which disengages the nitrous acid. At the works of Messrs. C. Tennant & Co., where this process is in use, they employ Gay Lussac's process for absorbing the nitrous acid from the escaped gases of the chambers, and M. Dunlap's process is used to such an extent as is found needful to provide for the waste of nitrous acid which occurs, notwithstanding the use of Gay Lussac's process. It will thus be seen that the immense quantity of sulphuric acid made by the Messrs. Tennant & Co., is formed without any nitrate of soda used specially for obtaining nitrous gas to be applied to the oxidation of sulphurous acid.

Condensation of Nitrous Vapors by Gay Lussac's Process.—The condensation of the excess of nitrous vapors that escape at the exit of the furnace in sulphuric acid works, by Gay Lussac's process, is very generally employed in France, but to a very small extent in England, where eight to ten parts of nitrate of soda are employed to every 100 parts of sulphur burnt. In all well-directed establishments this apparatus should be used to save the excess of nitrous vapors, and, while its use requires skill and care, it will reduce the quantity of nitrate required to less than two thirds, and the saving will very much more than pay for the increase of expense and attention. This method has been long known, and is fully described in works on industrial chemistry, so that no detail of it need be given in this report.

Purification of Sulphuric Acid from Arsenic.—The acid is sometimes boiled with a little common salt, and the arsenic goes off as terchloride of arsenic. But probably the most efficient and practical method is that adopted by Kuhlmann in his large acid chambers. The sulphurous acid from the combustion of the pyrites passes into a small chamber of 1,500 cubic feet capacity, that communicates with the furnace by a large leaden pipe forty or fifty feet long, sustained on its inside by iron bands covered with lead. In this way the sulphurous acid is cooled before it reaches the acid chambers, and several condensible products are deposited, among them the arsenious acid.

It is also purified by means of sulphide of barium, at Chessy, as it comes from the lead chamber, or by sulphureted hydrogen; this last is successfully used at Freiberg in the following way: The apparatus used for making the sulphureted hydrogen is composed of two large leaden vessels, placed side by side, and communicating with each other at the bottom. One of the vessels is filled with sulphide of iron and the other with diluted sulphuric acid. The gas as it is produced enters a long column full of coke, while the acid from the chamber is run through the coke by a kind of receptacle that alternately fills and empties itself, thus giving an intermitting flow. As the acid has time to spread over the coke, the sulphydric acid and the arsenious acid react on each other. The flow of gas is regulated according to the quantity of arsenic present. The acid thus acted on falls into a leaden receptacle, is allowed to settle before it is concentrated in the lead pans, and, finally, in the platinum still.

The separation and purification from nitrous acid, when the sulphuric acid contains it, can be effected by adding either a little sulphate of ammonia or alcohol in the lead pans used in the first concentration.

Concentration of Sulphuric Acid.—It is well known that the acid, as it comes from the lead chambers, is first concentrated in lead pans. Little or no improvement has been made in this part of the concentration. In these pans the acid can only be brought to a degree of concentration equal to 1·70 sp. gr. Further concentration is carried on in glass or in platinum vessels.

The high price of platinum, and its monopoly by the Russian Government, from which it gets into the hands of a few manufacturers, has driven many of the makers of sulphuric acid to return to the use of glass which they had once abandoned. In addition to this there has been considerable improvement in the manufacture of large lead-glass vessels so that now about four fifths of the acid made in England and Belgium is concentrated in glass, of which the original price and breakage, etc., do not exceed half of the annual interest of the cost of platinum stills. The vessels are very large, and are heated in open fire, or in iron pots, with a thin layer of sand between them and the sides of the pots. The vessels are kept constantly at work. The acid is drawn off by a siphon, and the vessels are immediately refilled with hot acid. The temperature of the room must be kept very warm, and a proper provision should be made for carrying off the vapors. The heat and the presence of the vapors of acid are very injurious to the workmen, and they suffer more or less from them. In this way, in South Lancaster alone, 700 tuns of sulphuric acid of 1·85 sp. gr. are manufactured weekly.

In France platinum stills are almost altogether used, and the manufacturers of these vessels have exercised their ingenuity to diminish their cost, and none of them has succeeded so well in this direction as Messrs. Johnson & Matthey, of Hatton Garden, London. In 1862, in London, they exposed a still capable of concentrating from two to four tuns of acid in twenty-four hours, for not much more than twenty-five per cent of the former prices. The apparatus cost $2,500. In 1867, when I visited their establishment, they were actively engaged in the manufacture of platinum stills, making some with the neck of the still directed upward, to prevent the violent boiling of the acid from throwing over portions of concentrated acid. The platinum stills exhibited coming from the establishments of Desmontes, Chapins, and Quennessen, in Paris; Herasus, of Hanau; and Johnson and Matthey, of London, were most beautifully executed. In soldering all of these makers use gold, except the last-mentioned firm, who burn the sheets of the metal together at the seams and joints with the oxyhydrogen blowpipe, and for large vessels of platinum the last-mentioned manufacturers turn out work more to my satisfaction than any of the others.

It is not usually understood that while platinum is not virtually acted on by sulphuric acid it does experience a little and gradual loss of substance by the action of the acid, and this especially when it contains nitrous acid, but this last can be prevented by adding a little sulphate of ammonia prior to distilling. Even when this precaution is taken there is still a loss, less in new and more in old vessels, commencing with a loss of one gram and gradually increasing to two grams for every tun of acid concentrated. When the platinum contains iridium the loss is diminished 50 per cent, but the Paris manufacturers, I believe, are the only ones who have used iridium in their platinum, and they do not do it except by express order, for platinum that contains it is more difficult to work.

With this I will terminate the brief review of the present condition of the manufacture of sulphuric acid in the world, as brought out by the Exposition of 1867, and by the examination of old and well-established factories.

An Incident at the Fair of the American Institute.

One morning, says the *Tribune*, the Secretary of the Board of Managers, Mr. John W. Chambers, was having his boots blacked at the entrance of the Fair by a small boy, shoeless and stockingless. The Secretary, in his urbane manner, told this boy that if he would wash himself, and come to him the next day, he would admit him to the Exhibition. The next morning, a young lad, with his face polished by the use of soap, appeared in the office, and asked to be admitted to the Exhibition, as he had been promised.

"When did I promise you?" said the Secretary.

"Yesterday morning, when I polished your boots."

"If you are the lad, come in."

He passed him to the Exhibition. Half an hour afterward, while the Secretary was passing one of the pianos, he noticed a crowd surrounding the instrument, and, to his surprise, found the young bootblack delighting the audience by the brilliant tones he was drawing from the instrument. It is a pleasure to record the fact that this young lad has been taken into the store of the manufacturers whose piano he was then playing. These gentlemen have furnished him with a new suit of clothes, and every evening he has been heard at the Exhibition playing equally well on the piano or electric organ. The boy is an orphan. His father, a German musician, taught his infant son to play, but after the former's death his son was thrown unprotected upon the world, and, finding nothing to do, earned a precarious living by blacking boots. His names is Charles Knubel; he is now fourteen years of age, and we have no doubt but that he will honorably be heard of in the future.

CURIOSITIES OF A CITY DIRECTORY.—It is an entertaining pastime to look over the pages of a city directory and see the variety of curious names and the great number of the same name it contains. For instance, the "New York City Directory, for 1869," has the name and address of Smith recorded two thousand and fifty-nine times; one hundred and eighty-nine bearing the given name of John. The Murphys number seven hundred and sixteen; sixty two bearing the name of James, one hundred and nine John, and fifty-nine Patrick.

WE are much gratified to state that since the inauguration of President Grant, the public debt has been reduced $64,352,070·65. This fact not only demonstrates the efficiency of the present administration in the collection of revenues, but the the immense resources of the country.

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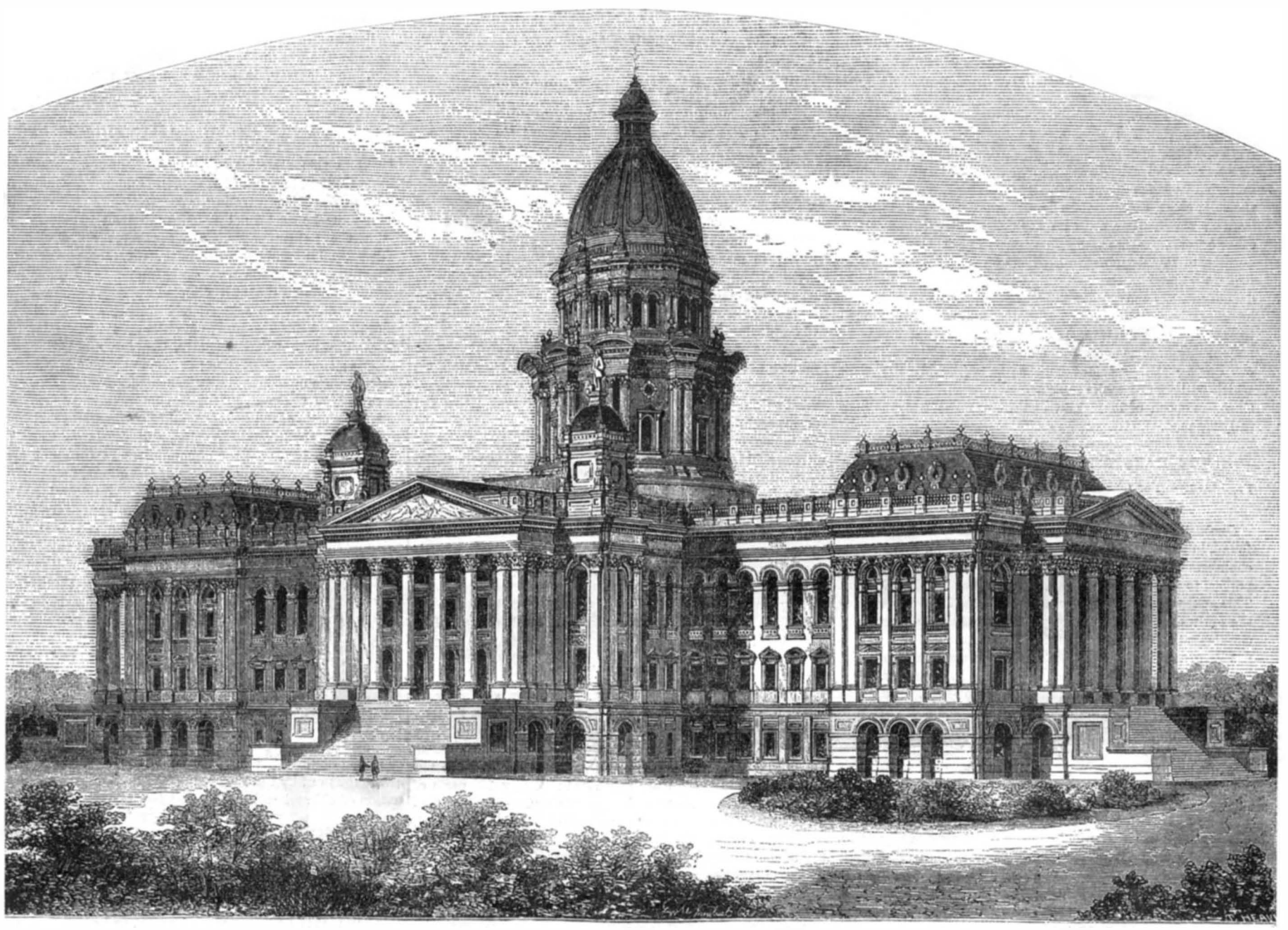
The New State Capitol, Illinois.

We give a view of the New State Capitol now in the course of erection in Springfield, Ill. The ground plan is that of the Greek cross, arranged to present four fronts of similar style. The order adopted is the Corinthian. The north, east, and southern fronts of the superstructure are each to be supplied with a portico of eight detached columns in front, the outer two on each side being coupled. The western façade presents the same exterior, except that when entering the building you pass into the basement through a stylobate, the portico not projecting as far as on the opposite front. The tambour of the dome comprises two stories, the first ornamented with disengaged columns in pairs; and the second with pilasters. From the top of the latter springs the dome, surmounted by a lantern. There is a balustrade on the top of the entablature of the first story, consisting of pedestals and balusters. The hight from the ground to the top of the lantern is 254ft. The dome at its base is 83ft. in diameter, outside the walls. The building is 354ft. long by 240ft. wide; the hight is 95ft. The interior is to be finished in the same elaborate style. Messrs. Cochrane & Garnsey, of Chicago, are the architects; Mr. J. W. Ackermann (late of London), acting as draftsman. The corner-stone was laid with Masonic ceremonies on the 5th day of October, 1868. The whole structure will cost $3,000,000.



THE STATE CAPITOL OF ILLINOIS.

Refining Oil.---How it is Done.

Our readers, says the Oil City *Weekly Times*, are probably, most of them, aware that petroleum is a product found in many parts of the world, and that it has been known to man for more than two thousand years; a spring of it, on the island of Zante, one of the Ionian group, being described by Herodotus. And we read that at Agrigentum, in Sicily, petroleum was collected and burned in lamps as a substitute for oil; and in more modern times Parma and Genoa in Italy were lighted with supplies of this oil obtained in Amiano and other places. We also know large supplies of it have been obtained at Bakoo, in Georgia, on the borders of the Caspian Sea, and at Rangoon, on the Irrawaddy, in Burmah, for several centuries, and that it has been for a long time in use in Persia and India, both for its lubricating and illuminating purposes, and also for preserving timber against insects and as a medicine. It has been known and collected in this region from its earliest settlement by the whites, and was previously known and used by the aborigines. The product was used in a crude state, and though its qualities were known, no progress was made in the manner of distilling it until Reichenbach, of Moravia, undertook an investigation of its properties, the results of which were published in 1830-31. These attracted the attention of scientific men, and stimulated experiments, and, in 1834, a patent was issued to Selutated. These stills are filled with crude oil, and fire applied in the furnaces beneath them, and as the heat increases it causes vapors to arise on the surface, which are carried forward to pipes immersed in water, and the vapors flowing through these pipes are condensed into a liquid which runs out at the end of the pipe. The first product of the pipe is gasoline, a very light hydrocarbon, weighing on Baumé's hydrometer 77°. This gasoline is composed of different degrees, beginning as high as 83°B., and running as low as 75°. The temperature of the stills is necessarily increased as the distillation progresses, and the next product obtained from the pipe is called naphtha, benzine or benzole, which is taken from 75° to 63° B. This mixture of degrees will stand at about 67°. The next production of the stills is refined petroleum, called distillate, such as used in lamps. This is produced until as the distillation progresses about eight or ten per cent of the original quantity contained in the still remains, which is called residuum or tar. This is drawn from the bottom of the still and has been generally used as waste and fuel, but of late it has been re-distilled for the purpose of obtaining paraffine and lubricating oil. Paraffine is a fatty material, resembling sperm in appearance. The product, taken off of a gravity between 63°B. and the tar, called distillate, still retains a greenish color, and its disagreeable odor, and the next step in the process of refining it is the treatment with sulphuric acid. For this purpose it is placed in a tank where it is violently agitated by means of an air pump, forcing air through the oil, and while thus agitated a quantity of sulphuric acid equal to one and a half or two per cent of the oil is added, after which the agitation is continued fifteen to thirty minutes. The blast of air is then stopped and the oil allowed to settle, when the acid and impurities are drawn from the bottom. The oil is then washed, first with water, and then with caustic soda, by which means the remaining impurities are removed, and any portion of the acid remaining in the oil is neutralized. [Some parties heat the oil before treating in order to get what is called the "fire test."] The oil is then taken to shallow tanks, called bleaching tanks, where it is exposed to light and air, and allowed to settle; it is then heated by means of a coil of steam pipe running through it, to generate all gaseous vapors which will ignite at a temperature below 110° Fahrenheit, and to cause their evaporation. The oil is now called a "fire test" oil and is ready to be barreled and sent to market.

Ornamenting Glass.

The *Mechanics' Magazine* states that Mr. George Rees, of Holloway, has lately patented an invention for producing ornaments or devices by vitrifying pounded glass upon glass and glazed ware, or by cementing together fragments of colored glass or glazed ware by vitrifying a layer of pounded glass on to the fragments. The glass, after it is pounded, is sifted through sieves, the meshes of which correspond to the sizes of the particles of glass to be used on the surface of the glass or glazed ware. The new process is as follows: Take a sheet of glass and prepare the surface by brushing a gummy or other adhesive liquid thereon. Then sprinkle pounded glass over the gum, which adheres to it. The glass thus prepared is placed in a furnace, or under heat in any suitable manner, in order to vitrify the pounded glass upon the surface of the sheet glass. The pounded glass may be of one or a mixture of colors, or the sheet glass may be of a white or other color. When it is required to form a pattern on the surface of the sheet of glass, cover the intended part with gum, and then sprinkle the required colored pounded glass on it. The other portions of the pattern are likewise similarly prepared, and pounded glass of a different color is sprinkled on those. These operations are repeated until the required number of colors are sprinkled on. The sheet of glass is then heated to the required degree to reduce the pounded glass to almost a liquid state; when the glass is removed from the furnace the pounded glass is found to have fixed itself into or on to the surface, and forms a rough face. If the sprinkled sheet of glass be left under heat for a longer time the pounded glass runs and intermixes itself in the surface, and thus produces a smoother face.

In carrying out the second of the above described methods of this process the inventor takes broken or shaped fragments of colored or plain glass, or glazed ware or metal, and arranges them in any desired pattern, placing them in a metal mold. He then spreads over them a layer of pounded glass or other vitreous substance in such a manner that the powder shall enter the interstices between the fragments forming the pattern, and shall cover the entire back surface of the pattern to such a depth as may be convenient. He then removes the whole to a furnace and vitrifies the mass, thus cementing together with a thorough vitrified cement the colored device and giving it a solid back.

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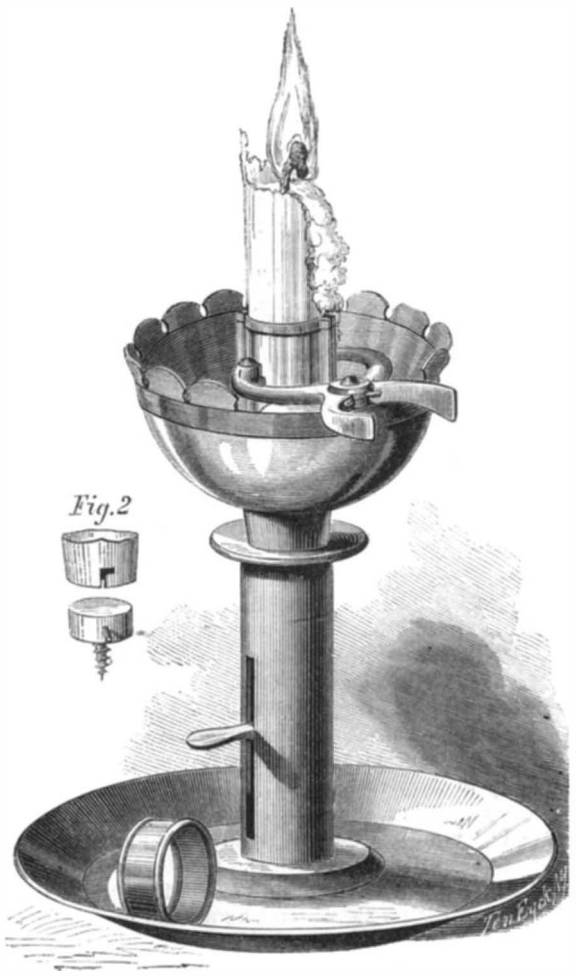
AULT'S IMPROVED CANDLE HOLDER AND GREASE CUP.

Of all the arrangements trying to the souls of good housekeepers, the dropping of grease is, perhaps, the worst. Dwellers in cities, who, for the most part, use gas lights, do not, perhaps, appreciate the advantages possessed by them over those in rural districts, where, even people who employ kerosene lamps, are obliged to resort, more or less, to candles.

It is to obviate the dropping of grease, and to also furnish a means of holding, firmly and vertically, candles of different sizes, that the simple device, illustrated in our engraving, has been perfected.



It consists in the application of a cup to the ordinary candle stick, with hollow stem, to hold the candle, and which, also, is inserted into the candlestick, in the manner shown in the engraving, together with a spring clasp attached to the edge of the cup, which grasps the candle and holds it in a perfectly upright position. Each arm of the clasp is provided with a concave piece of metal, at the inner end, which closes upon the candle, and the outer end is formed into a thumb-piece. The pressing of the thumb-pieces together releases the candle.

To adapt the improvement to use on Christmas trees, etc., the lower end of the hollow stem which supports the grease cup is slotted as shown in the detail at the left of the engraving. A small cylinder of wood with pins projecting radially, fastened by a screw to the limbs of the tree or place where it is desirable to fix the cup, forms a convenient attachment. The slots in the lower part of the hollow stem engage with the pins in the wooden support in such a manner that they are locked together.

The attachment of the clasp or candle holder is made to a ring at the top of the grease cup which may be unscrewed for convenience in cleaning. Its application to chandeliers where wax candles are used will also suggest itself.

This invention is the conception of E. G. Ault, of Dundas, Rice Co., Minnesota, who may be addressed for the entire right, or for rights to manufacture on royalty.

WINKELHOUSE'S IMPROVED BIT HOLDER.

Of the many devices intended to hold bits in the stock, we have seen none that seems better adapted to serve the purpose than that illustrated in the accompanying engravings. It is simple, durable, and perfectly reliable, holding the bit so firmly that its shank would probably break in an attempt to draw it by main force from the stock.

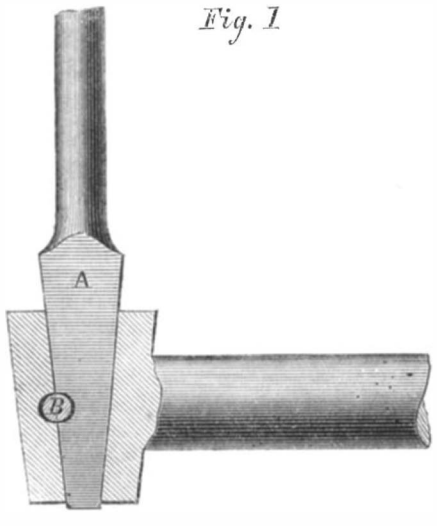
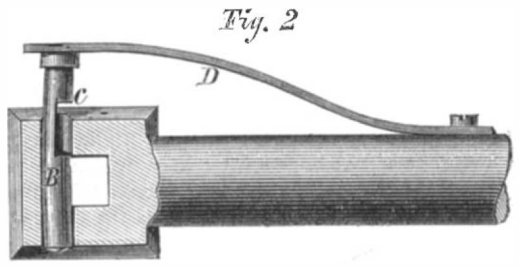


Fig. 1 is a section of the holder with a bit in the socket, and Fig. 2 is a section showing the form of the pin which locks the bit in the socket, and the manner in which it is held by the spring.

A, Fig. 1, is the portion of the bit filling the socket of the bit holder. A semi-cylindrical concavity is cut in the holder, and another to correspond in the bit. These two concavities form, when the bit is entered, a hole in which plays the key-pin, B. This key-pin is attached to a spring, D, its normal position being that shown in Fig. 2.



A portion of the key-pin is cut away at C forming a recess in the side of the pin, the length of which corresponds to the width of the socket.

When the pin is pressed inward this recess is brought to coincide with the socket, and a bit may either be withdrawn or inserted.

When the pressure is removed from the head of the pin the spring withdraws it, so that its unrecessed portion fits both the concave recess in the socket and that in the bit, and the bit is firmly secured.

A shoulder in the pin next the spring prevents it from being pressed in too far.

Patented through the Scientific American Patent Agency, September 21, 1869, by Jacob Winkelhouse, who may be addressed, care of Dr. Hudson, 696 Broadway, New York city, for further information.

AERIAL NAVIGATION.

NUMBER TWO.

The grand obstacle in the way of operating artificial wings, for the purpose of flying, by steam power, has been the unavoidable weight of the steam boiler. To obviate this, engines have been invented to work without boilers, being furnished with small generators which are heated to redness, and having small quantities of water injected into them, for the purpose of producing steam instantaneously, at a high pressure. This plan appeared feasible to most scientific men until the experiment was made and the theory tested, when it was discovered that red hot iron would not immediately convert water into steam. Engines were also projected—being suggested by the steam engine—to be operated by the gases produced, or liberated, by the combustion of gunpowder, or its constituent materials; and there is yet room for further experiment on this subject; but the heating of the machinery, and the adherence of the residuum to the cylinders employed, have thus far defeated these efforts.

Various plans have been projected for propelling and guiding the common spherical balloon. In 1845 an Italian gentleman, under the euphonious cognomen of Tuzzio Muzzi, gave a lecture with an illustrative exhibition, in one of the most popular halls in this city; and, being a foreigner, he raised curiosity and expectation so high as to fill the house with a fashionable audience desirous to learn the art of aerial navigation. His lecture was brief, because he had not much to say, and not much occasion for saying it. After descanting on the prevalent desire for aerial locomotion, he brought out a miniature balloon, three or four feet in diameter, and furnished with a pair of horizontal, inclinable planes, so often employed before by other inventors, for the purpose of producing a forward movement, by their alternate inclinations, according as the balloon is made to ascend or descend by the ordinary means. But the idea was new to a New York audience, and all appeared satisfied that a balloon might be propelled at least half a mile per hour, in a still atmosphere.

Some time after a Mr. Taggart, of Massachusetts, gave out word that on a certain day he would sail from Lowell to Andover, and return to Lowell; a distance of ten miles. At the time appointed, he did succeed in reaching Wilmington, a few miles to the right of Andover, but could not return. This aerial machine, having an out-rig in front of the car, which was furnished with a propelling device, to be operated by a man within the car, and having a long rudder in the opposite direction, might evidently have been propelled moderately, in any direction, in a perfectly calm atmosphere; but could not stem the least breeze of wind, and, of course, could not be made available for navigation.

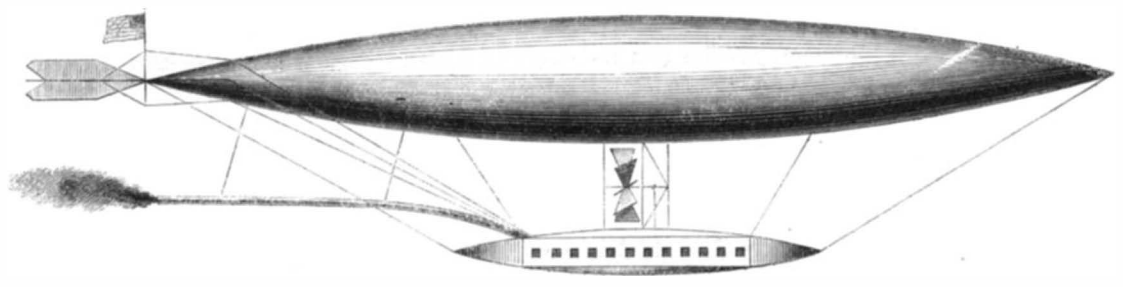
But in nearly all the experiments on this subject, the projectors have overlooked the immense atmospheric resistance which a balloon must encounter, if propelled with any considerable velocity through a calm atmosphere. Take, for instance, a balloon capable of lifting 1,000 lbs., including its own weight; the diameter of the balloon, even if filled with pure hydrogen gas, must be 31 feet, and its area 750 square feet, which is equal to a plane surface of 600 square feet, placed at right angles with the direction of the motion. To propel this surface with a velocity of twenty miles an hour, would require a continuous force of 1,200 lbs.;—equal to 650-horse power.

Several persons during the present century, have been shrewd enough to discover that an oblate spheroid, or a parabolic spindle, would encounter less atmospheric resistance, in passing through the air, than a ball or globe.

Among those who projected plans for the employment of parabolic spindle balloons, was a Mr. Pennington, of Baltimore, who proposed to suspend a cubical box, at some distance below the center of the balloon, or aerial float, to serve as a cabin, and contain a steam engine; the power of which was to be applied to some device for propelling it. But our diagram of the machine having been mis-laid, we cannot give a full description; nor is it essential at present, since the plan has been abandoned without a trial of its merits.

Prior to this Mr. Ira Smith, of Massachusetts, invented an aerial or flying apparatus in which a parabolic spindle was to have been employed; but as he did not put it in operation, or publish any description of it, we cannot describe his mechanism, nor his intended mode of management. In 1853, Mr. Edward D. Tippet applied to Congress for an appropriation to bring into practical use, what he styled his "Magnificent Aerostatic Machine," which he declined to explain; and the mode of propulsion of which, he "profoundly keeps to himself," as it is "the only plan which will ever answer the purpose." But not having at command sufficient funds to build his machine himself, he, of course, could not afford to buy or procure a sufficient amount of lobby influence, to work up the case in Congress to any favorable result.

It is not our purpose to advocate any man's theory any further than it has been supported by practical demonstration. But the practicability of ascending into the atmosphere, sailing among the clouds, and moving in different directions by means of different currents at different altitudes, has been established by Professors Wise, Pauline, Low, and others. But all this is far from being satisfactory. Men want to travel through the air, not only in any required direction, but with any required velocity, or, at least, with a speed exceeding that of ordinary gales of wind, and independently of atmospheric currents. Can this be done? The few who admit the possibility are forced to confess that they cannot see *how* it can be done. And among the most skeptical on this subject, are those who have the most experience in balloon traveling. Still there are some who not only persist in their confidence, but offer arguments and demonstrations, not easily refuted; and one at least, who challenges the world to meet him in public discussion on that subject; he taking the affirmative. That man is Mr. Rufus Porter, of this city, who has probably devoted as much time and expense to study and experiment on this subject as any other man in this country. Mr. Porter claims to have invented the main features of his aerial ship, or (as he terms it) aeroport, as early as 1820, but constructed his first model at Bristol, Conn., in 1833. In 1847 he procured the construction of an operating model, which was publicly exhibited in this city; and while that was being exhibited by his friends here, he constructed a larger and improved model, and exhibited the same at Temple Hall, in Boston. These models were propelled through the air by propelling wheels operated by springs; but the inventor proceeded to Washington, and there constructed and exhibited a model twenty-two feet long, by four feet in diameter, and propelled by a regular steam engine, operating a pair of propelling wheels, and guided by a four-leaved rudder. This model consisted of a float of the form known as the revoloidal spindle, made of fine oiled silk, supported internally by twelve rods three eigthths of an inch in diameter and extending from point to point. Three feet below the float was suspended a saloon, seven feet long and ten inches in diameter, of the same form as the float only that its cross section was square instead of being round. This saloon was furnished with a row of open windows on each side, and the representation of many happy looking passengers looking out at, or sitting opposite the windows. When adjusted above the stage of Carusi's large hall—furnished with flags, and gaily painted—and standing still without contact with anything, there was considerable sensation, and many rose to their feet; but in a moment the steam valve was opened and the miniature aeroport started forward, and with rapid speed sailed round the circumference of the hall and returned promptly to the position whence it started.



RUFUS PORTER'S AEROPORT

As it is a matter of some importance to the public that

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these facts should be established as precedents, we copy the following notices of these exhibitions, from papers published at that time.

"The Aerial Steamer Model was again tried at the Merchant's Exchange yesterday afternoon, and with brilliant success. It described the circle of the rotunda eleven times in succession, following its rudder like a thing instinct with life. With its description of each circle, burst after burst of applause arose from the excited throng, and followed it throughout its journey. At the close of the performance, three loud cheers were given for the steamer, and the auditors quitted the rotunda with very manifestation of pleasure and delight."—*New York True Sun.*

"The Model Aerial Steamer was exhibited again in the Merchant's Exchange yesterday, and satisfied some of its greatest opponents that it could navigate the air."—*New York Sun.*

"Mr. Porter's flying machine did all that it promised on Wednesday evening. It rose above the audience, and went round the hall, exactly as he said it would, and the spectators gave three cheers for the successful experiment."—*Boston Bee.*

"The flying machine did fly last evening, though rather low. At the second and third attempts, the apparatus went round the hall, just over the heads ot the auditory, very satisfactorily, and elicited three hearty cheers from the spectators. Mr. Porter may be considered as having fairly demonstrated the theory of aerial navigation; but it is only in the open air that the practicability of the theory can be demonstrated."—*Boston Mail.*

"Aerial Navigation.—Mr. Porter has made several successful exhibitions of his model aeroport, or flying ship, at Carusi's saloon, on which occasion the assembled spectators manifested much excitement, admiration, and gratification, as the steamer with its gay saloon and flying colors, sailed about the hall, floating in air, and with the semblance of several passengers looking out at the windows of the floating saloon. On Friday afternoon the pupils of several schools assembled, and witnessed with manifest pleasure, the phenomenon of a steam vessel sailing through the air, propelled by an operating steam engine."—*National Intelligencer.*

"The Flying Ship.—The performance at Carusi's saloon last evening, was highly satisfactory, and elicited frequent applause from the excited audience. A mode of traveling rapidly and safely through the air, in any required direction, has been desired by man in all ages of the world. But never prior to the introduction of Mr. Porter's model aeroport, has anything appeared upon which creeping humanity could base a rational anticipation of the long desired art; and even with the reality of a bona fide aerial steamer, men are inclined to imagine that what they see is but an optical illusion, or some peculiar affection of the imagination. But there is the tangible fact before them—a real, mechanically-constructed steam ship, with its wheels, engine, and cargo, floating in air, and occasionally shooting forward in directions or circles, according to the dictates of its engine and helm."—*Washington Evening Star.*

After having tested the main principles of his invention on a small scale. Mr. Porter made arrangements, procured materials, and commenced the construction of an aeroport at Washington, on a scale large enough to do good service, provided it had been carried through to completion,and had performed according to his anticipation. He constructed an aerial float 160 feet long, by 16 feet in diameter, made of varnished linen cloth, supported internally by twelve rods extending the entire length. Suspended about sixteen feet below was a saloon sixty feet long and eight feet in diameter, tapering on a curve each way from the center, and furnished with seats for passengers, and glass windows in the sides. In the center was an engine room,six by five feet, in which were a four-horse power boiler, and two cylinder engines. The float was furnished with a rudder with four leaves, two vertical, and two horizontal, with four steering lines descending to the saloon cabin. Between the float and saloon, were mounted a pair of six-fan propelling wheels, ten feet in diameter, connected to the engines by endless-chain belts. The buoyant power of the aeroport over all the weight of float, saloon, engine, etc., would have been 700 lbs. All parts of the apparatus were finished, ready for operation, and the inflating boxes arranged, with a full supply of acid and zinc for inflation,when it was discovered that the varnish,which had been used for preparing the float, had so weakened the linen that it would support but little more than its own weight; and while the workmen were engaged in repairing and strengthening it—the float having been partly inflated with air for that purpose—a sudden and severe storm, with a violent gale, rent the float so extensively, that, winter coming on at the same time, the work had to be abandoned. Mr. Porter has since discovered a varnish that will not injure the fiber of linen, and intends to construct an aeroport to carry sixty passengers as soon as he can command the requisite funds for that purpose.

The fact has now been satisfactorily established, that hydrogen gas may be so confined in a bag, balloon, or other light casing, as to lift ponderous substances from the earth, and hold them suspended in atmospheric air; that a long revoloidal spindle may be propelled through the air with less application of force, than a globe of equal buoyant capacity; that an inflated revoloidal spindle may be propelled rapidly through the air by the rapid rotation of oblique fans, or blades of fan wheels; that men and light steam engines may be supported in air by the buoyant power of hydrogen, and that a revoloidal-spindle float may be steered by a rudder, while moving through the air by the application of the force of springs, or of steam power. Yet another fact remains unremoved, namely, that successful aerial navigation, for common traveling, and business purposes, has not yet been established; and that a large portion of intelligent scientific and business men are still skeptical on the subject of its practicability. It is interesting to observe the various arguments presented against it by men of reputed intelligence. The *Philadelphia Bulletin*, in noticing Mr. Porter's exhibitions, remarked as follows:

"Though every man of sense is, or ought to be, aware of the impossibility of steering a balloon, or any other aerial machine, yet it seems there has been found, in New York, a fellow who was knave or fool enough to advertise, for exhibition, a Flying Machine, at the Tabernacle; and that there were found Dogberrys sufficient to fill that huge building. We have heard of nothing more ridiculous since a theater was once filled,on the other side of the Atlantic, to see a man get into a pewter pot. It would seem as if the gullibility of human nature kept even pace with the wit of knaves, and that nothing could be proposed for an exhibition, too preposterous to find believers. In this very case,the thing proposed was an impossibility. A ship is steered in the water because the action of the wind on the sails, and of the hull in the water,can be brought to counteract with each other by means of the rudder. Now, a flying machine is but in one element, and hence can never be steered. Yet, as in the analogous instance of perpetual motion, there will be found dolts to believe in it, we suppose, to the end of time. Alas, poor humanity."

A well-known gentleman in Washington, who is regarded as a very scientific man, contends that a long revoloidal spindle would encounter more frictional resistance in passing through the air, than the amount of atmospheric resistance, obviated by its revoloidal form, as compared with that of a globe. Another gentleman volunteered to aver, in the presence of a large audience, in this city, that when a long revoloidal float should be running at right angles with the direction of a fresh breeze of wind, the force of the wind against its side would be so great, that even heavy iron plates would not be strong enough to resist it. A very popular balloonist of this city declared, publicly, that no other form of balloon than the spherical could be made to float in air. And there are many who can not see the possibility of any effectual action of the propelling wheels upon the air, when the wind is ahead, and, consequently, passing rapidly away from the fans of the wheels; and that experienced aeronaut, Professor Wise, is apprehensive of difficulties in encountering vertical, and, sometimes, whirling currents in the air. Whether Mr. Porter has discovered reliable means of obviating all the apprehended difficulties, readers may judge, after an examination of his theory, which has been published in pamphlet form, and from which we shall extract such portions as appear to be the most illustrative of the main subject.

On the practicability of aerial navigation, Mr. Porter thus argues and describes his plan of construction:

"One hundred years of research and experiment, since Montgolfier commenced making his miniature paper balloons, has sufficiently established the fact,that the only possible way by which any useful and controllable mode of navigating the atmosphere, can be established, is by the use of aerial floats of the form of the revoloidal spindle, inflated with hydrogen gas, and with saloons suspended below, of similar form, only being square in their transverse sections, and propelled by means of oblique revolving fans, operated by the power of steam, or its equivalent, and steered by means of four-leaved, cross-plated, or hollow-square rudders, connected to the floats by universal joints; the said float being made susceptible of enlargement or contraction, and the machine (aeroport) furnished with facilities for enlarging or diminishing the size of the float, or either end of it, without varying the quantity of the gas therein contained; and the saloon must be furnished with ready facilities for ascertaining the altitude, velocity, or course, even in time of mist or fog; and furnished, also, with a self-regulating gas replenisher, that will supply gas to keep the float uniformly full, without any attention from the engineer. It must, also, be furnished with means for producing power to propel the aeroport with sufficient speed to stem any gale of wind, or to keep a regular course when running at right angles with the direction of a gale.

"In order to illustrate the feasibility of accomplishing all these points, it will be needful to give a description, in detail, of the proper construction, furniture, and management of a regular, medium-sized aeroport, for actual service."

The details will be given in our next issue.

Nicholas W. Darrell, and the First American Locomotive.

Few among the thousands, says the *Rural Carolinian*, who are constantly passing up and down the South Carolina Railroad are aware what an ancient institution our pet road is, and most of our readers will be somewhat astonished, we have no doubt, on being told that the gentleman, a sketch of whose life, is herewith presented, ran on this road the first locomotive built in America, and that its first trip was made nearly forty years ago. What imagination could then have conceived anything like our present system of railways, covering a continent with a network of iron, and stretching out its many-jointed arms from the Atlantic to the Pacific? Here, right in our midst, was the small beginning, and here is the man who helped to give the initial impulse to the wheels of progress; living among us, beloved and respected by his friends and acquaintances, but unknown to the public. He shall be no longer unknown.

The following facts concerning him were kindly furnished by Mr. James M. Eason, himself an engineer, and a builder of engines, and familiar with the history of the S. C. R. R, from the beginning:

N. W. Darrell, the subject of this sketch, was born on the 12th day of November, 1807. At an early age he became an apprentice to the late Thomas Dotterer, to learn the "engineer's trade."

In the year 1830, the first American locomotive arrived in Charleston, and was named the "Best Friend." It was made at the West Point Foundery, New York, under contract with Mr. E. L. Miller, for the South Carolina Canal and Railroad Company (now represented by the S. C. R. R. Company).

Mr. Darrell, with others, was set to work putting the locomotive together, and he was the man who first opened the throttle valve of an American built locomotive. He was appointed to the responsible position of engineer of the "Best Friend," and in that position he continued until the arrival of the second locomotive, when he took charge of that.

For many years Mr. Darrell continued to run on the road; when, for his fidelity and experience, he was finally promoted to the charge of the machinery of the road as master machinist. He continued fulfilling the duties of this position until the close of the war, and still continues in the Company's employ. Mr. Darrell was noted for his devotedness to the interest of the road, and no day was a holiday for him, always anxious and feeling a large responsibility for the success of the road.

As engineer of the "Best Friend," he was undoubtedly the first locomotive engineer in America, and is a noted man in connection with the introduction of the era of railroads and locomotives into the United States, upon which so much of our prosperity, as a nation, depends.

Correspondence.

The Editors are not responsible for the Opinions expressed by their Correspondents.

Early Manufacture of Sulphuric Acid.

Messrs. Editors:—In the Scientific American, of October 16th, on page 246, I find an article treating on the subject of sulphuric acid, showing its great utility and the manner of its production.

I here take the liberty to place before your readers, some facts relative to the first manufacture of sulphuric acid, or oil of vitriol, in America, and give (as well as my memory serves me) a correct description of the apparatus used, the mode of its manufacture, by whom manufactured, and where made.

Previously to the year 1810, but little of the article was used in this country; and that little was imported from other countries, and until that time, its manufacture was unknown in America as an article of commerce. In the year 1810, Mr. H. Baldwin, a native of the town of Woodbridge, in the county of New Haven, Connecticut, a graduate of Yale College (assisted financially by Mr. Lott Newell, a fellow graduate), who conceived the idea of erecting a laboratory for the purpose of making experiments in chemistry, and for the further purpose of manufacturing sulphuric acid, or oil of vitriol, for the market. He procured for that purpose a building which belonged to my father, situated on the post road leading from New Haven to Humphreysville, it being seven miles from New Haven, and three from Humphreysville. In this building he established his laboratory which was arranged in two rooms, each 9 by 18 feet, one of which was elevated about six feet above the other and lined with heavy sheet lead, and having a door about three feet square in each end, which closed perfectly air tight. In the middle of this room upon a large stone was a kettle that would hold from fifteen to twenty gallons. The kettle was filled with brimstone and a small quantity of saltpeter, which he had previously ground together in an old fashioned wooden ring and wheel mill made for grinding apples for cider. The floor of this room was covered about four inches deep with water. The brimstone in the kettle was set on fire by means of a stone or bit of iron which was heated sufficiently hot to ignite it when thrown into it. The doors were then closed and remained shut twenty-four hours, at which time they were opened, the kettle refilled, and again set on fire. This operation was repeated for six days in succession, during which time the water had become as sour as ordinary vinegar by the nitrous substance deposited from the smoke. This water was then drawn off and boiled down in glass retorts (buried in a sand bath), until its weight indicated it to be of sufficient strength.

The furnace was in the other room situated on the ground and was constructed with two parallel walls of brick about two and one half feet high, and about eight feet in length, with a grate and ash pit at one end, and a chimney rising from the other end. The top was a corrugated sheet of metal on which was sand of sufficient depth to cover the retorts, which contained the water. Each retort contained about two gallons, and the number used at one time did not exceed twelve. In several instances his retorts were burnt and he came near losing his life from the fumes produced by the boiling vitriol. With this apparatus he continued his experiments, and subsequently manufactured it for two years, retailing a large portion of his product to the country cloth dressers, at 83 cents per lb.; the residue was sent to market in New Haven and New York, where it attracted the attention of a business firm, one of whom (a Mr. Morrison) came to Woodbridge and arranged with Mr. Baldwin to remove his laboratory to New York, and there, with the aid of proffered capital, to erect a chemical factory on a larger scale. Accordingly his leaden room was stripped of its lining, the sheet of lead being rolled in large rolls, which, with such other portion of his equipage as was movable, were taken by ox teams to Derby, and from thence to New York, where it was again put up for use. The location was in the north-western suburbs of the city, near the banks of the Hudson river. I think the place was called Greenwich at that time. Mr. Baldwin continued to superintent the manufacture of this establishment for several years, until his health became so impaired that he

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was obliged to retire, when he returned to the home of his childhood where he remained until his death.

In the above, I have given a brief description of the origin of the chemical factory in New York, and the mode by which the oil of vitriol was first manufactured in this country.

Skaneateles, N. Y. JOEL G. NORTHRUP.

The Discovery of Oersted Contested.

MESSRS. EDITORS:—In one of the latest numbers of an industrial journal of this city, appears the following passage: "The real discoverer of the fundamental principle which lies at the base of all the present different systems of telegraphs in use, was Oersted, of Copenhagen. For more than a century a relation had been known to exist between electricity and magnetism, but the nature of this relation remained a profound secret until, in 1819, Oersted discovered what has been called, after him, the law of Oersted, namely, that the magnetic polarity lies at right angles around the electric current, and *vice versa;* the direct result is that any compass needle will place itself across the electric current, and the experiment illustrating this is called the experiment of Oersted. If ever a discovery was important in its far-reaching results it was this, and in the whole field of human progress there is scarcely another instance in which one single and simple principle bore such rich fruits, not only in regard to useful, practical application, but also in divulging to us some of the hidden mysteries of forces which appear to lie at the foundation of our very existence as living beings." I should have refrained from quoting these sentences, if they did not truly express the belief of the authors of our text-books on physics and kindred sciences But, this being the case, I cannot but call attention to the fact that the Russian *savant*, M. Hamel (*vide* the *Bulletin de l'Academie de St. Petersburg*, vol. ii. p. 116), nine years ago, proved that the discovery so unanimously ascribed to Oersted, had been made seventeen years earlier —in May, 1802—by the Italian physicist Romagnosi; it having first been published in the *Gazette* of Trent.

Undoubtedly, political, hole-and-corner journals are not the proper depositories for scientific discoveries, and it would rather be surprising if Oersted had searched for anything of this kind in such papers. However, an account of the experiments of Romagnosi was also inserted in *Izarn's Manuel du Galvanisme*, and in *Aldini's Essai théorique experimental sur le Galvanisme*, both of which were published in Paris in 1804. The discovery of Romagnosi must therefore have been known in scientific circles; besides, Oersted was in Paris in 1802, 1803, and 1813. He even maintained a lively correspondence with the author of the last-named work. It can hardly be possible, therefore, that the Danish *savant* was not acquainted with the facts in question. Of these the first-mentioned treatise states that "Romagnosi, a physicist of Trent, has discovered that the magnetic needle is deflected by the galvanic current." And in the latter, "according to the observations of Romagnosi, a physicist of Trent, the magnetic needle suffers a deflection when exposed to the electric current."

This, neither more nor less, constitutes Oersted's often-praised discovery.

With all due respect to this investigator, one cannot but confess that, in relating his own experiments, it would have conferred more praise upon him if he had also mentioned the labors of others. And it is characteristic that the discovery of the Italian scientist is still not recognized, although Cantu, in a pamphlet published in Milan, in 1835, again called attention to it. We learn from this that the exact sciences have also their dogmas to which they adhere, no matter whether they have been disproved or not; and, further, we learn that it is not sufficient to *make* discoveries, but that one must also understand how to present them to the world.

New York city. ADOLPH OTT.

[We publish in another column an account of the discovery above alluded to, and which has been generally attributed to Oersted.—EDS.

ON THE NATURE OF THE AURORA BOREALIS.

BY PROF. VANDER WEYDE.

The observation of Mr. D. K. Winder, of Toronto, communicated on page 230, current volume, SCIENTIFIC AMERICAN, concerning the spectrum lines of the aurora borealis, corresponds almost perfectly with those made by J. A. Angström communicated to the *London and Edinburgh Philosophical Magazine* for September, 1869. The first found a distinct bright line in the yellow, and one faint in the green; the last found "a single bright line to the left of the lines belonging to the calcium group," wave length 556·7; and "traces of three faint bands nearly as far as F." As the wave length of the sodium line D, in the yellow, is 538·8, the line of M. Angström is near to it; and as the line F is in the limit of green and blue, his three faint lines appear to correspond also with the faint line of Mr. Winder in the green.

These observations are meritorious and their publication valuable; however, the conclusions these two gentlemen draw from them are open to criticism. The first named comes to the conclusion that polar light is incandescent oxygen gas; this I most emphatically deny, as the spectrum lines of oxygen are entirely different. Its brightest line is not in the yellow near D, but in the red; and after Mr. Winder's own statement, "the dim line in the green," he could "not identify as belonging to any known substance." How then he can conclude that it is oxygen gas, I must confess not to comprehend. The lines of oxygen are nine in number, the brightest has a wave length of 615, the next 532, then 513, and 436 millionth of a millimeter; of the remaining five faint lines none corresponds exactly with the lines observed in the aurora, which exact correspondence is an absolute requisite to draw conclusions. Besides this, the hypothesis of the existence of such gas in excess, by decomposition of water, is rather far-fetched, principally when we consider that the auroral display sometimes reaches a hight of some 400 miles—far above our clouds or atmosphere—most likely never reached by watery vapor.

At the close of the article Mr. Winder attributes the fact that the solar spectrum lines are black to "absorption by passing through a deep luminous stratum of the earth's atmosphere." This is utterly erroneous; the common well-known explanation why these luminous lines are dark in the solar spectrum being that the solar atmosphere, consisting as it does of the vapors of sodium, lime, iron, etc., also incandescent in the body of the sun, act by interference, as the absorbing medium. The effect of our terrestrial atmosphere on the solar spectrum, and on that of the stars and nebulæ, is of an entirely different nature.

M. Angström comes to the conclusion that the northern light is not an electric luminosity, such as is produced in the electric egg or rarefied air, "because the lines he observed in the aurora do not agree with those produced by our experiments with electricity in rarefied air. Very interesting is his statement that he observed these same lines for a whole week in the zodiacal light, and I must confess that I felt at first disappointed that the whole of our electric theory concerning the aurora borealis, and our beautiful lecture-room experiments imitating it in large tubes and egg-shaped glass vessels, partially exhausted from air, were set all at naught by this single observation with the spectroscope.

Very soon, however, it became evident to me that this conclusion arrived at by Angström was false, remembering that Masson maintains that the lines of the luminous spectrum, as seen in the spectroscope, depend only partially on the chemical nature of the molecules of the medium which radiates the light and partially on the primitive source originating it. Foucault and Kirchhoff proved, indeed, that the double line seen in luminous sodium vapor, for instance, was not changed in position if the vapor was illuminated by solar, electric, or any other kind of light.

It is thus evident that the position of the lines observed in the aurora, zodiacal, or any other luminous phenomenon, prove nothing in regard to its electric or non-electric origin, but are a criterion for the chemical nature of the illuminated transparent matter, the super-atmospheric medium. They are also a criterion proving that the polar light is not derived from the sun, because in all substances illuminated from this latter source, traces of the lines of the solar spectrum are always visible; this is the case with the reflected light of moon, planets, clouds, etc. The spectrum of the polar light, on the contrary, shows no trace of the lines belonging to the solar spectrum.

Paper from the Reed Cane.

We learn from a Norfolk, Va., journal, that a company has been formed near that city for the manufacture of pasteboard, etc., from the fiber of the reed cane.

The process by which the fiber is disintegrated, though not new is interesting, and may not be known to many of our readers:

"The cane, just as it comes from the cane brakes, is put into a cylinder, about 25 feet long and 12 or 15 inches in diameter—steam at 200 pounds pressure is let into the gun from a boiler close by. After a few minutes the valve at the mouth of the gun is opened by a trigger arrangement, and the steam blows the contents of the gun into the open air. The cane is thereby thoroughly disintegrated; and the effect of the great heat of the steam at 200 pounds pressure is such that the resin and gums in the fiber are soluble in water without the use of chemicals, and the fiber can be beaten up in a paper-maker's rag engine and run off into coarse paper suitable for paper for board without any further treatment. A large part of the intercellular tissue is washed out by the process, so that the cellulose will fall on the machine.

"A bundle of cane four feet by eight feet by the length of the cane (averaging ten feet) yields a tun of steam blown fiber; the weight of that bundle of cane before it is blown from the steam cylinders, is about two tuns, about one half of the weight being water. The fiber on being blown from the cylinders, or guns, becomes quite dry in a minute or two, and is ready for baling. It is somewhat like oakum in appearance.

"The resinous and gummy matter, acid and coloring matter, to the extent of thirty-three per cent of the weight of the steam blown cane fiber, can be washed out by immersing it in water and then squeezing out the liquid.

"A battery of ten guns of the ordinary size (12 inches diameter) will yield fifty tuns of fiber per day.

"It has been found at Wilmington that the cost of a quantity of cane sufficient to make a tun of fiber, as disintegrated by the explosive force of steam (Lyman's process) is under four dollars a tun, including all expenses and the delivery of the cane at the works. This will be about the expense at Norfolk and Mobile, or at Memphis, Baton Rouge, etc., varying, however, somewhat in each locality.

"The expense of reducing the cane to fiber by a puff of steam is very slight. If coal be used it will take one tun of coal for five tuns of the fiber; but in most cases sufficient refuse timber for fuel can be got from the cane region, and being transported to the works by the same means which are used for the transportation of the cane, the cost of wood for fuel is less than that of coal.

"Notwithstanding the great utility of the cane, the cane lands can never become of much value, because they are so vast and inexhaustible. Indeed, except on a few choice spots they will remain of no salable value, even when thousands of tuns of the steam blown fiber shall be used daily in the United States for paper and building materials and other purposes, and other thousands of tuns shall be exported daily to Europe.

"When it is understood that it costs five cents per pound to reduce wood to paper pulp by the ordinary chemical processes now in use, and four cents per pound by Voelter's mechanical process, now used extensively in France and in some parts of the United States, the vast importance of the process of disintegration by steam will be at once recognized. It costs less than one fifth of one cent per pound to reduce the cane to fiber by that process, ready for the paper-maker's beating machine. Moreover, the cane is much cheaper than wood.

"For common, coarse articles, such as paper box-board and pasteboard, plain and bituminized, for building purposes, it is impossible to get anything so cheap as the steam-blown cane fiber, and consequently very large quantities of those articles will be worked up by the water power near Norfolk, especially at Richmond and Fredericksburg. Moreover, large quantities the cane fiber will be exported to the Eastern States, and to England and France."

New Mode of Fettling or Lining Puddling Furnaces.

An invention patented in England consists in lining puddling furnaces with crude or prepared oxide of manganese or manganese ore either as the chief ingredient of the fettling or as an addition to the oxide of iron or other material which is employed. In using crude or native oxide of manganese, or manganese ore without admixture with other solid, an ore is used, which, when pulverized and moistened, will form a plastic and pasty mass, and which when heated will harden and adhere firmly to the sides and bottom of the puddling furnace. For this purpose the cheap oxides containing a considerable proportion of iron are best suited, provided they do not also contain other impurities, such as sulphur and phosphorus, which would injure the iron in the furnace. When an ore or prepared oxide is used which does not harden sufficiently, after being rendered plastic by water alone, it is mixed with a sufficient quantity of finely powdered and moistened hematite, or other suitable material to give it the property of hardening and adhering when heated in the furnace.

The proportions in which oxide of manganese and oxide of iron should be mixed, in order to make the fettling according to this invention, vary with the nature of the cast or pig iron to be puddled. With pig iron of ordinary quality, about half a hundredweight of oxide of manganese mixed with the requisite quantity of oxide of iron for the fettling of the furnace is sufficient for a charge of four to five hundredweight of pig iron. When the pig iron itself is rich in manganese a less proportion is necessary in the fettling. When the pig iron contains a large quantity of silicon and little manganese, more oxide of manganese is required in the fettling than is required with pig iron containing much oxide of manganese and little silicon. Where practicable the inventor prefers to introduce the pig iron into the puddling furnace in a melted state; when this is done, and the fettling containing oxide of manganese is laid on the bottom and lower part of the sides of the furnace, the charge gets the full benefit of the evolution of oxygen, which takes place when the oxide of manganese is heated. By the use of oxide of manganese, as described, the puddling process is expedited, and the quality of the iron or steel produced is improved. The heated iron or steel during the puddling process decomposes the oxide of manganese, causing an evolution of oxygen, which, rising through the molten iron or steel, rapidly oxidizes the oxidizable materials contained in the metal. A portion of the reduced manganese enters into alloy with the iron or steel and effects the improvement in the quality of the metal which is well known to result from the use of manganese in the manufacture of iron or steel.

When oxide of manganese is mixed directly with the charge for fluxing, as has been proposed, a portion is liable to become mechanically distributed through the mass of iron or steel in the state of an infusible powder, consisting of manganese in a low state of oxidation, and injures the mechanical properties of the metal. But when oxide of manganese is used in the fettling of the puddling furnace according to this invention, it is gradually decomposed as the carbon and silicon of the pig iron or steel are presented to it by the stirring of the puddler, and the manganese enters the charge in a fused state either as reduced metal or as silicate.

Very little of the manganese which enters the iron or steel during the puddling process remains in the finished metal, most of the manganese separating during the finishing of the metal in the form of silicate of manganese, carrying with it other impurities, such as phosphorus and sulphur. The silicate of manganese separates from the metal more readily than silicate of iron, and is found in considerable quantity in the cinder and hammer slag. The cinder and hammer slag are, therefore, more valuable than ordinary cinder or hammer slag for the making of cinder iron, in consequence of their richness in manganese. Although the fluxing property of oxide of manganese, either alone or mixed with oxide of iron, renders the addition of any other material to the fettling unnecessary when pig iron or steel of the ordinary qualities are puddled, yet when pig iron or steel of such quality as renders the use of alkaline fluxes desirable is about to be puddled, common salt, or carbonate or nitrate of soda may be added to the oxide of manganese. A quantity of the soda salt, equal to about one fourth of the weight of the oxide of manganese, is generally sufficient.—*Mechanics' Magazine.*

MR. LOWE, the English Chancellor of the Exchequer, is an accomplished velocipedist, although he began practice at the age of fifty-eight.

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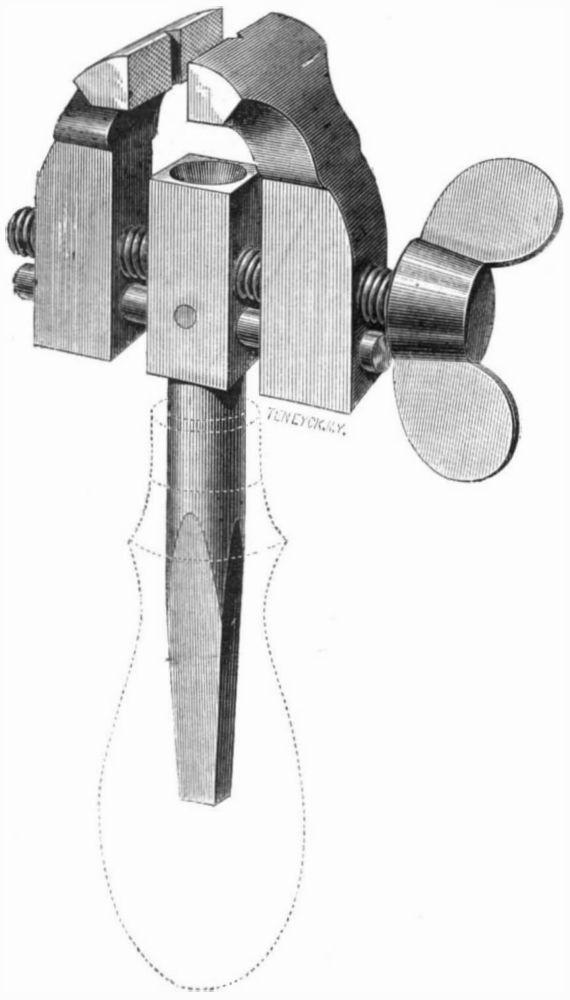
STEVENS' PATENT HAND VISE.

The vise is a tool of such universal application that no mechanic can do without it. The improvement shown in our engraving is intended to serve better in general work than the old hand vise, and has some special adaptations impossible to the old one. Having parallel-faced jaws, it takes a good hold of the work and gripes it securely with but little strain on the thumbscrew. But the main feature of peculiarity is its shank, around which a dotted line in the engraving shows the form of a wooden handle very convenient in filing a rolling piece. This handle may be slipped off and the shank



inserted in a half-inch hole in the bench, when it becomes a neat permanent vise for light work. This shank is turned round, with parallel sides to fit lathe chucks, and is also tapered at the end to fit the bit stock. In the upper end of the shank is a deep countersink, and central with it is a vertical groove in the face of the jaws, by which arrangement twist drills, and all tools with regular shaped shanks, are held firmly and perfectly coincident with the axis of revolution as the jaws are moved by a right-and-left thread so that they move equally to and from the center.

So this tool has not only the many uses of a perfect hand vise, and light bench vise, but serves all the purposes of a drill chuck, at one third its cost. It supplies a great need long felt by mechanics and amateurs, by serving to hold, either in lathe or bit stock, all sizes and shapes of shanks, from three-quarter inch down to the smallest shanks employed.

We have often called the attention of those wishing to engage in manufacturing, to the large profit derived from the production and sale of light staple articles, the parts of which may be duplicated by machinery. From its many uses and perfect adaptation, we think the vise herein described and illustrated cannot fail to recommend itself.

Further information to any one wishing to purchase the entire right of the United States may be had by addressing the inventor, W. X. Stevens, of East Brookfield, Mass., to whom a patent was granted Sept. 28, 1869.

Making Foundations in Marshes.

A new process of making foundations for bridges in marshy soils has, according to the *Railway Times*, been recently used on a branch line of the Charentes Railway Company, in France. This line crosses a peat valley to the junction of two small rivers; the thickness of peat was so great that any attempt to reach the solid ground would have been very expensive. In order to obtain cheaply a good support for the bridge, two large masses of ballast, accurately rammed, were made on each bank of the river, and a third one on the peninsula between the two. The slopes of these heaps were pitched with dry stones, for preventing the sand from being washed away by the rain or by the floods in the rivers. Over the ballast a timber platform is laid; this platform carries the girders of the bridge, which has two spans of about 60 feet each. When some sinking down takes place, the girders are easily kept to the proper level by packing the ballast under the timber platform; this packing is made by the plate layers with their ordinary tools. This simple and cheap process has succeeded quite well.

The same difficulty was overcome by a different plan on an ordinary road near Algiers. This road crosses a peaty plain nearly one mile broad; the floods and elasticity of the ground prevented the formation of an embankment. The road was to be carried over a viaduct across the valley, but the foundations of this viaduct presented serious difficulties); the thickness of peat or of compressible ground being nearly 80 feet. It was quite possible to reach the solid ground with cast iron tubes sunk with compressed air, or with any other system, but neither the implements nor the suitable workmen were available in the colony, and it was a great expense to bring them, and especially the workmen, from France. The use of timber piling was of course out of the question, as timber is very expensive in Algiers, and quickly becomes rotten; but there was a set of boring implements with the men used to work it. The engineers began boring holes 10 in. in diameter down to the solid ground. These holes, lined with thin plate iron pipes, were afterward filled with concrete up to the level of the ground. Each of these concrete columns bear a cast iron column; these columns are properly braced together and support the girders of the viaduct, which is divided into spans of about 20 feet, and is 20 feet high over the ground. This system has succeeded very well, and is to be extended to another large valley.

MASSEY'S PATENT LOW WATER DETECTOR AND GAGE COCK COMBINED, AND HIGH AND LOW WATER DETECTOR.

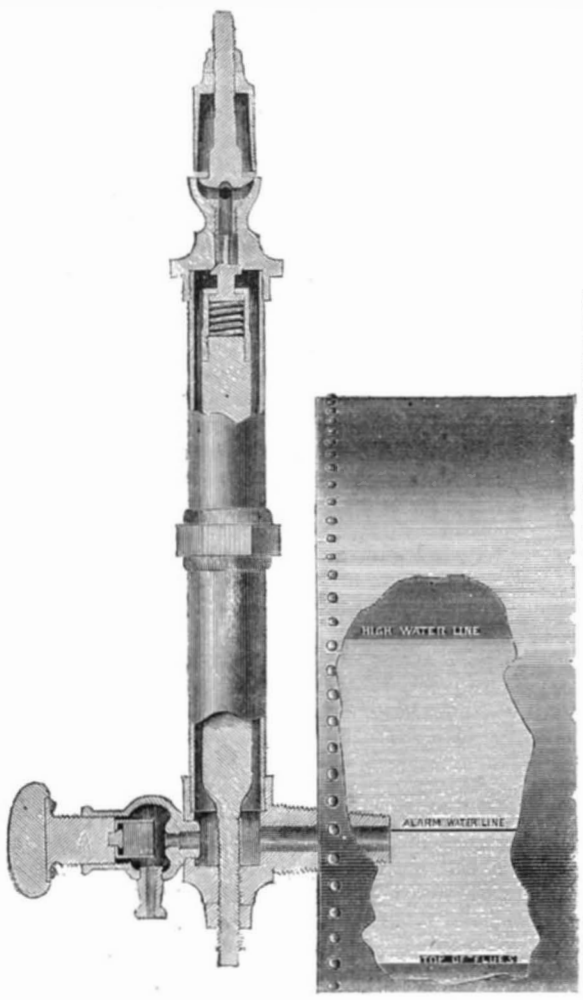
The attention of owners of steam boilers is yearly becoming more attracted to the utility of high and low water detectors, the latter more especially. We have latterly illustrated and described a number of safety devices of this class, and we this week present to our readers two other inventions of a like character, which have, although recently introduced, acquired considerable reputation as safe and efficient instruments.

Fig. 1 is an engraving of a low water detector, and gage cock combined. The instrument is made of seamless brass tubing, one and a fourth inches in diameter, and twenty inches in length; with suitable brass fittings, with gage cock at the lower end, arranged to screw in the boiler in place of the lower gage cock; and a brass fitting, with steam whistle at the top end. In the center of the tube is a cast iron rod, galvanized to prevent rusting, the upper end holding the whistle valve, and the lower end passing down through the lower casting, which is threaded and arranged for adjusting with a wrench, as may be fully understood by reference to the accompanying engraving. The spiral spring shown in the upper end of the iron rod, is to admit of further contraction of the tube as it cools below 212°—the point of adjustment.

The operation of this instrument is based upon the different amount of expansion in iron and brass at the same temperature, brass expanding nearly twice as much as iron. The difference in temperature of steam at atmospheric pressure, or fifteen pounds, and at one hundred pounds, is 126°. This indicator being carefully adjusted at 212°, or boiling water, must be still further expanded when subjected to an increased degree of heat; and repeated tests have fully proven that twenty pounds of steam is amply sufficient to insure the prompt sounding of the alarm whistle.

When the water in the boiler is at the "high water line," or above the "alarm water line," the communication with the detector is submerged, and consequently, the pressure of steam will force water in the detector, the temperature of which cannot exceed 212° Fahrenheit. At this temperature the detector is adjusted.

FIG. 1.



When the water in the boiler *descends* to the "alarm water line," the water in the detector will gradually descend, by its own gravity, into the boiler, and steam takes its place in the detector; the increased heat of which will expand the tube nearly twice that of the cast-iron rod, raising the valve seat above the valve, allowing the steam to escape through the whistle, sounding the alarm, which will continue until the water in the boiler rises to a safe hight, when the tube will contract to its former adjustment, and the alarm cease.

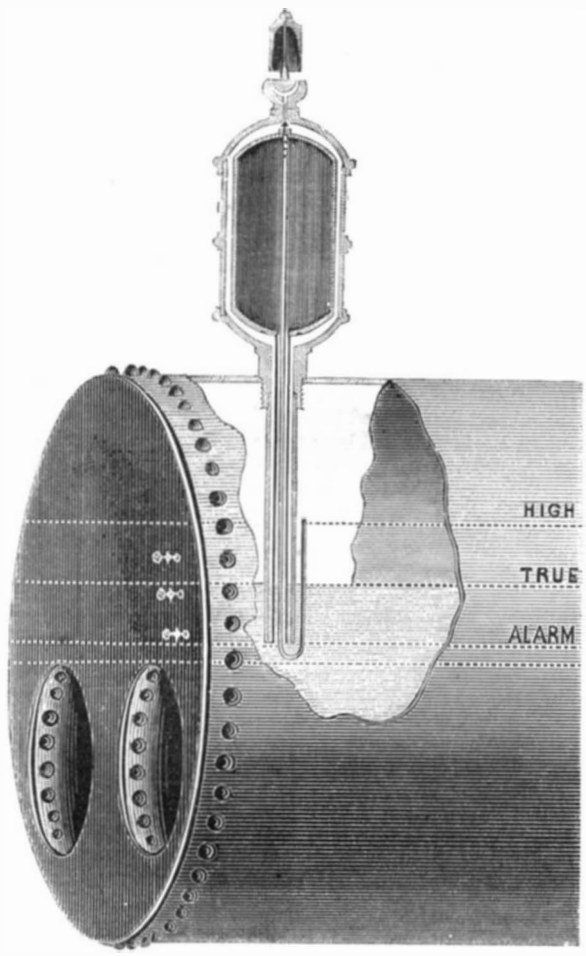
The extreme simplicity of this device and the sound principles upon which it is based, will be obvious to engineers without further description on our part.

A cap not shown in the engraving, screws into the lower part of the instrument, which secures it against being tampered with.

Fig. 2 is an illustration of a high and low water detector combined. It is made either of galvanized cast iron or brass, as the purchaser may desire; both being equally effective, but those of cast iron being of course cheaper.

In the construction of this detector a steam-tight chamber is made, about five inches in diameter by eight or ten inches in hight, with steam whistle at the top, and threaded at the lower end to screw in through a one and a half inch hole on the top of the boiler; to the lower end of this chamber is at-

FIG. 2.



tached a light one-inch brass pipe, extending down to the "alarm water line," or say one or two inches above the flues. Inside of this chamber is a metal float, about four and a half inches in diameter, and seven to nine inches in length, with the whistle valve attached to its top end. To the lower end of this float a light brass pipe, a half inch in diameter, is attached, and extended down even with the outer pipe, or to the "alarm water line." Through this half inch pipe a fourth inch pipe is passed to the top of the float, and perforated so as to allow steam to pass out in the interior of the float; the lower end of this small pipe being curved up on a level with the "high water line," as shown in the engraving.

When the water in the boiler is at the "true water line," the pressure of steam will force water up in the chamber through the larger pipe until the float rises and closes the valve. The float, having both steam and water connections with the boiler, when the water is below the "high water line," must be filled with steam which will equalize the pressure and prevent collapsing.

Now, it is obvious that when the water in the boiler falls below the "alarm water line," and below the end of the pipe communicating with the chamber, that the water in the chamber will, by its own gravity, descend into the boiler, and its former space be occupied by steam, and that the float, now becoming a weight, falls to the bottom of the chamber, opening the valve and sounding the alarm. In case the water in the boiler rises above the "high water line," both communications with the float being submerged, it will soon fill with water and fall to the bottom of the chamber, opening the valve, allowing water to escape through the whistle, which must soon attract the attention of the engineer and prevent damage. When steam goes down in the boiler, air will pass in through the whistle, which at once becomes a perfect and certain vacuum valve.

This indicator, being automatic, will adjust itself immediately after the water in the boiler falls below the "high water line," or rises above the alarm water line, ten seconds of time only elapsing before it announces low water, and one minute for high water. This instrument is, we believe, the only one yet patented which has pressure equalized on outside and inside of the float, thus insuring it against collapsing or sinking.

The first prize, a bronze medal, has just been awarded this instrument, at the recent Massachusetts State Fair, held at Boston.

Patents were obtained through the Scientific American Patent Agency for these instruments as follows, by G. B. Massey, of New York: On the first described instrument, Feb. 23, 1869; on the second Sept. 28, 1869; and patents on the same have been secured in France and England. Address, for further particulars, J. W. Blake & Co., 56 John Street, General Agents for the Massey Low Water Detector Company.

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THE PROTECTION OF PROPERTY.

It is an old proverb that "God helps those who help themselves." It might be said also that even at this late day the administration of justice remains so imperfect that the law helps only those who help themselves, so far as the protection of property is concerned. Even in countries where police duty is confessedly performed in the most efficient manner, and where a thief caught, is as a rule a thief condemned and punished, citizens feel it necessary to supplement the arm of the law by all the means in their power.

No departments of mechanical art have given birth to more numerous devices, or combined in a greater degree ingenuity and constructive skill than those whose products are designed for the protection of property against thieves and fire, these being the principal enemies which are to be combated on land.

In the invention of locks there has been displayed a vast amount of study, thought, and ingenuity. All departments of science have been drawn upon to prevent thieves from withdrawing bolts that have been shot; and one of the latest and most ingenious of these applications is that of magnetism, the subtile influence of which has enabled the combination lock, hitherto not inaccessible, to defy the most expert picklocks.

The ingenuity of honest men has been taxed to the utmost to circumvent the opposing ingenuity of rogues; for it is nearly always the case that when some improvement stops these gentry for a time, they learn to surmount it, and the minds of inventors are again taxed to create new obstacles.

A great deal of skill and talent has also been expended in the attempt to render walls as well as locks burglar proof; and as it was found practically impossible to do this on a large scale at a price within the means of ordinary persons, the practice of building burglar-proof boxes or safes, was introduced at a very early period in the history of the world. Constant improvement has been requisite in the construction of these safes, as the resources of burglars have nearly kept pace with those of the safe builders. They have, however, at least, been partially brought to bay before chrome iron, chilled iron, and steel; how long they will remain so remains to be demonstrated.

In fire proof safes the problem is how to combat a fierce, but blind, unreasoning force, limited in its operation, and the effects of which are well known and understood. Much success has been reached in the construction of safes which will resist the action of fire for a long time. Of these the most successful have been those which do not depend merely upon the non-conductivity of some substance to protect the contents from the action of external heat, but upon the power of steam to absorb and rapidly convey away heat. The water is generally inclosed between the external and internal walls of safes in the form of "water of crystallization" in some salt, alum being by far the best for this purpose, as it contains a very large percentage of water.

When the crystals of this salt become heated they give off the "water of crystallization" gradually, and it is converted into steam at 212°. So long as this steam is generated the contents of the safe cannot be injured as the temperature therein can not rise higher than 212°, no matter how great the external heat may be. Water has also been inclosed in tubes with plugs fusible at a low temperature, which, melting as the heat rises, allow steam to fill the safe.

A vast number of inventions based on the above principle or upon others less reliable, have been made and patented, many of which have had their day, but some of which remain deservedly popular.

How immense the distance also from the old fire syringes and buckets of medieval times to the superb and powerful steam fire engines of the present. How the "devouring element" must have laughed at those insignificant squirt-guns, in their impotent efforts to subdue it.

The last ten years have given birth to two important additional means of security, namely, the Burglar Alarm Telegraph, and Safe Deposit Companies.

Our readers are well informed in regard to the ingenious application of electro-magnetism, to the giving warning against the entrance of burglars through doors and windows. The principle is capable of extension, so that if, through neglect in setting the instrument, or by the superior art of the burglar, entrance should be effected, he could not pass about a building without giving notice of his presence.

The Safe Deposit Companies afford facilities to people about to absent themselves from their residences, for the security of valuables while they are absent, and also for the safe keeping of valuables at any time. They were called into existence by a necessity, which, as it must in the nature of things be permanent, will afford them a permanent support.

The time is probably far distant when any or all the means employed for the protection of property from robbers will avail to give perfect immunity from their encroachments; still, with those now employed their profession would be rendered a most hazardous one, were the administration of justice as perfect as the mechanical devices intended to protect property from such marauders.

REPORT OF THE REGENTS OF THE SMITHSONIAN INSTITUTE.

The report of the Secretary, Professor Henry, states that at the last session of the board it was resolved to memorialize Congress, asking that the usual appropriation of $4,000 for the maintenance of the National Museum might be increased to $10,000, and also that $25,000 might be appropriated towards fitting up the large room, in the second story of the building, for the better exhibition of the Government collections. The request was refused and only the usual appropriation was made.

In view of the facts that $4,000 was the sum appropriated when the museum was under the charge of the Patent Office, that since its removal to the Institution its size has been trebled, that the currency is greatly depreciated, and that the amount expended since the fire of 1865, is over $140,000, the greater part of which was for the accommodation of the National Museum, it is hard to see why, if the sustaining of this museum is considered necessary, the moderate request of the Regents should not have been granted.

The fact that $20,000 of the $140,000 expended since 1865, were paid out of the last annual income, renders the results attained during the year particularly praise-worthy.

The funds of the institution are reported in better condition than they were at the time of the preceding report by $18,000. The total capital of the Institution after payment of all liabilities is $697,000, a gain upon the original bequest of Mr. Smithson of over $155,000.

The fifteenth volume of the "Smithsonian Contributions to Knowledge" has been published and distributed to institutions of learning in this country and in Europe. A large number of valuable and interesting papers are in hand, and will form parts of the sixteenth volume of the same publication.

The general appendix to this report contains a large amount of valuable scientific matter, together with biographic sketches of scientific men. These latter comprise a memoir of Cuvier, with a history of his works; a memoir of Oersted; a notice of Christian Frederic Schoenbein, the discoverer of ozone, with an appendix giving an account of the principal discoveries of that distinguished investigator; a memoir of Encke; and a memoir of Eaton Hodgkinson, the celebrated English engineer, with reviews of many of his inquiries and demonstrations.

These are followed by a translation of a very important paper on "Recent Progress in relation to the Theory of Heat," by A. Cazin, and another one from the pen of Dr. Joh. Müller on the "Principles of the Mechanical Theory of Heat," with a large number of illustrations, the execution of which fully entitles their perpetrator himself to execution. The subject matter, however, of this paper, and the thoroughness and perspicuity with which it is treated, render it one of the most valuable works upon heat ever published in English.

The next contribution in order is a short but valuable paper on the "Continuous Vibratory Movement of all Matter, Ponderable and Imponderable," by L. Magrini, of the Museum of Florence. In this paper the attempt is made to prove that *movement is a fundamental property of matter* in whatsoever state it exists, that the movement always has existed, and, though the author does not draw this inevitable and logical conclusion from his argument, *always will exist* so long as matter exists. We may at some future period review this paper at length.

We are next given a lecture by Dr. John Tyndall before the University of Cambridge, May 16, 1865, on the subject of Radiation, of which, having given the author's name, it is unnecessary for us to say it is a comprehensive and exhaustive discussion, exhibiting in a marked degree the peculiarly felicitous style characteristic of Mr. Tyndall's efforts.

The remainder of the volume is filled with records of scientific experiments, reports of learned societies in various parts of the world, archæological discoveries, etc., etc.; the whole making a volume which the Secretary might justly hope "would show the results attained to have been little inferior in value or extent to those of any preceding year."

THE RATIONAL CONSTRUCTION OF HOSPITALS.

We have been greatly interested in a correspondence which has been going on in the columns of the *Scotsman*, in reference to building the new Royal Infirmary at Edinburgh.

The parties to this discussion are Professor Syme, and Sir James Y. Simpson.

Mr. Syme is in favor of a large building, placing the utmost reliance in disinfectants for preventing the spread of disease, and those evils to which all such institutions are occasionally liable. The disinfectant upon which he chiefly relies is carbolic acid; but Sir James Y. Simpson denies its efficacy. The latter states that during the two years in which it has been employed the mortality from amputation has increased from forty to fifty-three per cent.

Instead of the large buildings hitherto employed as hospitals, with their numerous wards, bedrooms, etc., he advocates a central building for the administrative part of such an institution, and the erecting upon the ground around about this central building a series of village hospitals or wards, furnished with the latest and best sanitary improvements.

He claims that in the construction of such buildings the great disinfectants and antiseptics that we should alone depend on are abundance of space, abundance of light, and above all, abundance of fresh, pure, and ever-changing air to every patient in every ward. He is right. During the recent war we saw an admirable test of the correctness of his views. It was our privilege to contrast daily for a long period, the sanitary condition of patients crowded together in a large hospital, and others distributed in smaller buildings at considerable distance from the main hospital, used to supplement the accommodations of the larger building.

The increased comfort, and the improvement in the condition of the patients in these smaller wards were so marked as to attract the attention of, and elicit considerable remark from the surgeons in charge.

The huddling of people together, even when all are healthy, is attended with increased liability to disease. How much must such liabilities become exaggerated when the air is loaded with foul effluvia and exhalations, sickening even to healthy attendants, and which together form an odor characteristic of every hospital we ever entered.

Best of all restoratives are light, pure air, and rest, such as never can be secured to patients crowded together in large wards and forced oftentimes to witness involuntarily sights which, to those not inured by long familiarity with suffering and disease, are harrowing in the extreme.

We believe that were the suggestions of Sir James Y. Simpson adopted, a great benefit would be conferred upon suffering humanity.

SOLAR SPOTS.

If any of our readers had provided themselves with a piece of smoked glass during any of the bright days which were so plentiful during the middle of last April, they might have seen through it a group of remarkable spots on the sun's disk. These spots have been observable more or less during the entire summer. On the fourth of September five of these spots reappeared, after a short period during which the sun was almost wholly free from spots. Two of these spots were of very great size, the entire surface covered by these and other smaller spots being more than one fifth the sun's diameter.

These spots are of frequent occurrence, and although they cannot always be detected by the naked eye, there are few intervals when they cannot be detected with a telescope. We should not have felt called upon to say much about these spots at this time were it not for the fact that we are approaching a period when they are to be expected in greater numbers than at ordinary times. Mr. W. T. Lynn, of the Royal Observatory at Greenwich, England, says all things indicate that we are rapidly approaching a period of maximum of abundance and frequency of the solar spots. He estimates the most probable length of the interval between two consecutive maxima, as one ninth of a century, or eleven years and one month; this would bring us to another maximum in the course of the year after next, 1871, probably about the middle or towards the end of it.

As the period of the sun's rotation on its axis is 25·34 days, and its apparent revolution is 27·3 days in consequence of the change in the position of the earth during a rotation of the sun, the time for the reappearance of spots after having passed behind the western limit of the sun, unless they should be dispersed before his semi-rotation is completed, may be readily computed.

The April spots, or rather the spot, as although there were five distinct nuclei observed they were included in one penumbra, were estimated on the 13th of that month as being 55,000 miles in length, and 30,000 in breadth, covering an area of about 150,000 square miles.

Recent observations seem to put beyond all question that there is an intimate connection between disturbances in the sun's photosphere (light-sphere) and meteorological conditions of the earth's atmosphere. Some of these observations have found a record in the late volumes of this journal, and our readers will recollect them perfectly, particularly an article entitled "Storms in the Sun," published on page 139, current volume.

It is no wonder then that all solar phenomena should at the present time be of the most absorbing interest. We are probably on the eve of remarkable discoveries. The spectroscope is, in the hands of able investigators, throwing light on much that has been hitherto mysterious, and opening new avenues of research, the future of which it is impossible to predict.

Two hypotheses have hitherto been entertained in regard to the nature of the solar spots. The first is, that the vaporous

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envelope is deeper and of greater density where the spots are seen, thus partially intercepting the light from the photosphere; and the second is that the photosphere is broken up where the spots appear. The latter has been supposed by some to be caused by an upward rush of vapor from beneath; but we need not say that all this speculation has been of no real value to science in the absence of any facts tending to support them.

Mr. J. Norman Lockyer, F. R. A. S., a young English astronomer, who has achieved an enviable reputation as a sagacious and careful investigator, undertook, in 1866, to demonstrate if possible which of the two hypotheses, if either, was correct.

We cannot, in the limits of this article, follow Mr. Lockyer through the extended labors he brought to bear upon this subject. Suffice it to say he has by his perseverance developed a mass of facts in regar to the constitution of the photosphere which alone would render his name famous in the scientific world. The instrument upon which he chiefly relied was the spectroscope, and the conclusion at which he arrives is that neither of the hypotheses above stated is correct, but that the spots are produced by the sudden and downward rush of portions of the sun's atmosphere. It must be confessed, however, that Mr. Lockyer has yet to demonstrate the hypothesis—for hypothesis it must yet be called—which he seeks to substitute for the ones he has discarded.

Whatever these spots may be they must indeed be obstinate spots if they refuse to surrender to the "artillery of science" now leveled against them.

THE CRACK OF DOOM.

Shall we confess it? We have been badly frightened. Mr. D. T. Taylor, of Rouse's Point, is the man who has done it. The means employed is a small pamphlet, entitled the "Coming Earthquake and its Approach."

This pamphlet quotes from the following sources: the Bible, the SCIENTIFIC AMERICAN, Mungo Ponton's "History of Earthquakes," Herodotus, Mallet, Ansted, M. Alexis Perey, Professor Merriam, Humboldt, "The American Naturalist," the New York *Tribune*, the *Sun*, Dr. Burnet, *Harpers' Magazine*, *Chambers' Journal*, "Pollock's Course of Time," Darwin, "Wells' Geology," the hymns of Thomas of Celano, Luther, Wesley, and many others. Nearly all the religious periodicals and papers of the day are also quoted with some dozens of "eye witnesses" of earthquakes in different parts of the world. In so small a pamphlet these quotations leave little room for much original remark; but we gather that the writer expects the world to be brought to judgment very shortly, and that the day of judgment is to be ushered in by an earthquake of rather unprecedented extent and power.

We did not feel at all terrified while penning the numerous passages quoted from our pages by Mr. Taylor, but we confess that their reperusal has caused us much trepidation.

It does not detract from this fear, that the world has been so near its end many times before, and has always failed, as yet, to "come to time." If no quotation had been made from our own writings, we should have remained unperturbed; but it seems we have committed ourselves to the "coming earthquake," and we cannot "go back" on our own statements. We are bound to be scared, and we are scared accordingly.

The "coming man" is debarred from putting in an appearance. The coming earthquake will get here before him, and Parton will turn out a false prophet.

How this announcement will affect the price of gold we cannot predict, but those not in the ring had better stand from under.

ON EXPERIMENTS WITH DYNAMITE.

Under the direction of M. von Arx, experiments with dynamite have been lately undertaken in Switzerland, with the view especially to investigate what degree of danger is offered by it in transportation. Already the first blasting experiments gave proof of the extraordinary power of this explosive. The explosion took place in from two to four minutes. Two and a half cartridges detached a mass of six and a half cubic meters of hard rock in a bore hole of 1·11 meters depth and three centimeters diameter; and in another experiment, three and a half cartridges, when exploded in a hole of 1·32 meters depth, loosened a mass of seventy-one cubic meters.

Similar results were obtained in cast and wrought iron, and in water. A cartridge that was allowed to explode in the river Aare, threw a large volume of water to a considerable hight. In order to investigate the danger of spontaneous explosion, the dynamite was first subjected to chemical analysis. In treating it with alcohol, 76·6 per cent of nitro-glycerin were extracted, while a solid residuum of a reddish white color was left, that consisted chiefly of silica, and small admixtures of lime, oxide of iron, and alumina. The priming of the copper fusee was found to consist of fulminate of mercury. The effective portion of dynamite is consequently the nitro-glycerin, while the other substances serve merely to diminish the danger of spontaneous decomposition.

A blasting material of this kind may explode by great variations of temperature, by intense solar rays, shocks, electricity, and spontaneous decomposition. This last mentioned possibility must yet be referred to experimental investigation. However, the experiments have furnished very satisfactory results in regard to the other influences. Dynamite was not acted upon by steam, and when not inclosed was consumed slowly in the fire, but when inclosed, it exploded with considerable force. The effect of light was experimented upon by a mirror, the dynamite burning in its focus with light puffings, without explosion, and when exposed to a less concentrated light, no effect was found to take place. The experiments which were undertaken in order to examine the effect of concussion proved that explosion will only take place when the material is placed between two very hard surfaces, and when the shock is very powerful. However, if concussion takes place between iron and stone, explosion is rarely produced, and never so between iron and wood. Inclosed dynamite explodes easier, but the intensity of the shock must in all cases be great.

It was also thought of importance to examine whether the dynamite would explode by lightning. It was for this reason exposed to the discharge sparks of a large Leyden jar, and those of a powerful induction apparatus. As, however, explosion ensued in no instance, from the experiments the experts drew the conclusion that the transportation of dynamite is not attended with any danger. Changes of temperature, strong heat, even fire, and intensely concentrated solar rays do not produce explosion, so long as the material itself is not inclosed in vessels possessing great powers of resistance. And, while it will decompose by shocks, these will scarcely ever be intense enough to offer real danger. As regards spontaneous decomposition, there is nothing known about the new blasting material; however, it is evident that the earthy admixture must prevent a rapid decomposition, and only allow a gradual and slow one. Taken all in all, the dynamite offers considerably less danger than nitro-glycerin, and, since it is nearly equal to it in explosive power, there is no reason why the latter composition should not soon be replaced by the former.

THE EXTENSION OF PATENTS.

It is much more difficult to obtain the extension of a patent which is about to expire, than to procure a patent for a new invention. In the former case the law presupposes that the patentee has received a proper reward for his invention; in the latter the patent is granted to assist him in obtaining a reward.

The applicant for an extension must show to the Commissioner of Patents that the invention is of value; that he has faithfully endeavored to introduce it to the public; and that without any neglect on his part, he had failed to receive an adequate remuneration for the time, labor, and ingenuity expended. The rules of the Patent Office require that carefully-prepared statements, with proofs on these points, shall be presented to the Commissioner, who takes nothing for granted.

An example of the failures to observe the rules, sometimes made by applicants for extensions, resulting in the loss of their cases, is seen in the following official decision:

PAPER-CUTTING MACHINES (extension).—M. Riehl, August 27, 1869.—The applicant has fallen into a fatal error in making up his accounts, which renders it useless to consider the merits of his case on other points.

He first brings down his account to 1867. Previous to that time he had disbursed $87,500 on account of his invention, and had received the same amount in money, besides $35,000 in old machines received in exchange for his own. Upon these machines he expended $7,000, and sold them afterward for $40,000. Deducting from the latter sum the estimated value of the old machines, and the expenditures upon them, $32,000 in all, he credits the invention with the balance, $8,000. He also credits it with $340, being the profits made on new machines since 1867, besides $2,000, old iron on hand. The whole amount of the three latter sums, $10,840, is all, therefore, that he admits himself to have ever received on account of his invention. By a very moderate estimate he shows it to have been worth to the public $40,000, and relies upon this showing as entitling him to an extension.

It seems not to have occurred to him that the old machines he received previous to 1867 were also clear gain, and that the invention should be charged with the sum for which he sold them, $40,000, deducting the $7,000 he expended upon them. He should, in fact, have allowed their estimated value, $25,000, in addition to the sum he credited, $10,840, making $35,840 which he has received over and above all expenditures. This approaches so near to the supposed value of the invention as to destroy his claim to a further monopoly.

There is reason to believe that the applicant might with propriety have made a far more favorable exhibit of his case had he not fallen into a delusion by his manner of presenting his accounts. An opportunity was offered him, accordingly, to explain and correct them. Unfortunately, he was so situated as to be unable to prepare them anew. It is out of the Commissioner's power to remedy the mistake, and he is left without any ground for finding that the petitioner has not been pretty nearly remunerated for his ingenuity, time, and expense.

The patent cannot be extended.

S. H. HODGES, Acting Commissioner.

THE NOTTINGHAM KNITTING MACHINE, AND GADD & MOORE'S IMPROVED ONE SHAFT LOOM.

We have been much interested in the inspection of some English knitting machines, now on exhibition at Room 13, Harlem Depot, in this city.

The principal of these is what is known as the Nottingham Machine, invented by the Nottingham Manufacturing Co., Nottingham, England. This company is represented by Mr. John Kent, 324 Broadway, New York, who is pleased to exhibit and explain the operation of the machines to all who feel interested in their examination. This gentleman has also applications for patents in important improvements in knitting machines now pending through the Scientific American Patent Agency.

The machines exhibited produce full-fashioned stockings, drawers, shirts, etc. The stocking frame is arranged to make eight legs at once with clear welts and narrowed down to the heel. Mr. Kent inform us that a 24-gage frame will make thirty dozen legs per week; or with two frames for legs, and one frame for footing, employing the labor of one man and two girls, from sixty to seventy dozen of finished stockings can be made per week, which is a more rapid production than any machine with which we are acquainted with is capable of performing

The frames for drawers and shirts are arranged with four sections for knitting four sides of drawers, or four complete shirt sleeves, full-fashioned. When making drawers the frame widens the leg to the gusset, and then narrows up the back. In the widening process one needle has to be cleared of its loops which leaves an eyelet hole in the texture. This is filled up by a very simple device which operates while the widening course is forming, thus perfecting the fabric on the frame, and obviating hand labor for this purpose. We believe no other frame is capable of doing this on widened fashioned knitted goods.

A comparison of the goods with those of ordinary American make shows a great superiority in their finish. There is great want of uniformity in American goods of this class. In purchasing by number a good fit is very uncertain, large bodies with short sleeves, and sleeves of different lengths on the same body, bands of different sizes, and similar defects, often perplex the wearer of these articles.

Goods made on these machines are free from all the above defects, the widening and narrowing being uniformly done as required.

The machines are in successful operation in the manufactories of the proprietors, and J. R. Morley & Co., also of Nottingham. Other English manufacturers have been refused licenses.

The Dudley Hosiery Company purchased, two years since, the right of this machine for the United States, and recent important improvements have been transferred to them. Other American firms desiring to compete with English goods of this class are either employing these machines or negotiating for them.

We were also shown a small machine for making rib tops with perfect selvedges, stiff welts—slack course, and splicing thread put in. This machine produces a first-class rib top for half hose, cuffs for shirts, bands for drawers' bottoms, etc. It can be adapted to make 2x1 rib stockings with fancy stripes. It works forty courses per minute. This machine has been ordered by a large number of leading manufacturers; and we trust it will work a reform in the character of the rib tops now put on American shirts, drawers, and half-hose. If our hosiery knitting manufacturers expect ever to compete in quality with English goods, they must pay greater attention to finishing details.

We are now taking out a patent for Mr. Kent on an improvement in circular knitting machines, which produces an imitation seam in circular knitted goods for half-hose stockings, shirt-bodies, etc. It makes a very handsome seam indeed, much more regular than can be done by hand-work. Ribs may also be run on and cleared, when required for half-hose legs. To change the frame so as to adapt it to making the plain circular web, or the imitation seam, is the work of only a few moments.

These improvements would probably have never been introduced into this country but for the protective policy now adopted by our Government. This is additional proof of the wisdom of that policy, which not only sustains such industries as we now have, but draws into the country valuable improvements and even new industries.

The Gadd and Moore's patent loom is also shown in connection with the knitting machines. This is probably as cheap a power loom as was ever built. It is a one-shaft loom of the most simple construction, working equally well with the over-pick and under-pick, and with very little consumption of power. As a calico loom, for which work it is specially designed, its merits must be admitted in this country as they have been in England. The motions are all positive except the shuttle motion.

Mr. Kent stated to us that he would be happy to see and give information to those not directly interested in the manufacture of such goods in this country, but who feel in any way desirous to promote the advance of American industry.

Carbon Pointed Tool for Dressing Emery Wheels, etc

In a recent visit to the office of Mr. John Dickinson, No. 64 Nassau street, New York, we were shown the operation of his new patent Shaped Carbon Tool for turning and dressing emery wheels, grindstones, etc., which is extremely effective.

This is the only tool for this purpose in which the application of *shaped* carbon is made. The points of these tools have five distinct cutting edges, which may be substituted one for another, according to the kind of edge required for special kinds of work, the time required to make the change not being more than five minutes.

People not accustomed to this kind of tool are often disappointed when they first get one, in regard to the edges. They should bear in mind that the action of the carbon points is that of grinding rather than cutting; a sharp edge like that on a steel tool is therefore not desirable, although to do good work the general form must approximate to that of steel points employed for similar purposes.

The Raid Against Vaccination.

A long article recently appeared in the New York *Times*, taking the strongest ground against vaccination, urging that it propagated disease, while as a prevention of mortality from small-pox, it was utterly inefficient. This article represented views now entertained by many upon this subject. The London *Lancet* in an article in favor of vaccination, makes the following remarks:

"The fact is, that the only people injured by the Compulsory Vaccination Act are medical men. And they are seriously injured by it, as we can easily show. There is no disease which pays medical men better than small-pox. A good attack of it makes a man, or child either, a patient for a solid

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month. Then the chances are that the patient is left very weak, and with a very eruptive tendency impressed upon him for another month at least. Styes, or abscesses, or eruptions are frequent results of small-pox. It puts vaccination in the shade for after consequences, which inconvenience the patient but greatly swell his medical bill. We saw a boy lately with an ulcer of the arm several inches long, which had been left by small-pox five years ago. Cullen well said, 'Though the small-pox be not immediately fatal, the more violent kinds are often followed by a morbid state of the body of various kind and event.' It will, then, be readily understood that when the law compels vaccination, it does a great injury to medical men, and aims a most serious blow at a disease which has occasioned many a good doctor's bill. Of course Mr. Gibbs, the itinerant lecturer against vaccination, says, and will continue to say—for it is impossible for him not to talk nonsense—that the present law is upheld by the medical press in the interest of the profession. We do not write with such a utopian object as that of convincing Mr. Gibbs. But the above simple statement will satisfy common and candid people that the Compulsory Vaccination Act involves a dead loss to the medical profession; and that if medical men and journals advocate vaccination, and even the compulsory enforcement of it, it is in direct opposition to their own interests. We are quite prepared for the abolition of the Vaccination Act. Medical men can and do, by vaccination, or rather by revaccination, protect themselves from small-pox, so that they go in and out among patients afflicted with this loathsome disease with perfect security. We have everything to gain pecuniarily by a return to the small pox *regime* of our forefathers, or the milder form of it which obtained before the present act was passed, and applied with such creditable firmness by the magistrates. Meantime, we shall continue our disinterested support of an act, which indeed is one of the wisest and most humane which ever adorned our statute book."

REPORT OF THE COOPER UNION FOR THE ADVANCEMENT OF SCIENCE AND ART.

We are in receipt of the tenth annual report of the above institution, which shows it to be in full and successful operation.

The report discusses the history of the institution from its origin in the liberality of its founder to the present time, during which it has conferred inestimable benefits upon the young mechanics and others through its system of free night classes, its schools of art and telegraphy for women, its musical department, its reading room and library, and its popular lectures upon scientific subjects.

The trustees state that "Far better and larger results would have been produced if the pupils who have been admitted to the institution had been better trained in the ordinary rudiments of a common-school education, namely, reading, writing, and arithmetic, a good knowledge of which is essential for any higher progress. By far the larger number of applicants have been ignorant of arithmetic beyond its simplest elements, showing that the existing night schools maintained by the public authorities, valuable as they unquestionably are for the primary education of the foreign element in our midst, are not so organized and conducted as to give a thorough knowledge of arithmetic, without which it is vain to attempt a mathematical course or to make any scientific progress. The trustees have therefore considered the propriety of establishing a training or prepatatory school for the young men, over sixteen years of age, who must necessarily be refused admission to our classes in consequence of their ignorance of arithmetic. Such a school is required, but it is surely the duty of the Board of Education to establish it, and the trustees have decided to make a formal representation of the facts to the new Board of Education, in the hope that such a school for adults will be opened in October next for the reception of the pupils who must be refused admission to our classes in consequence of want of preparation. The necessity for such a school is made apparent by the fact that during the last ten years not more than one third of the pupils admitted to the mathematical department have remained until the close of the term, and that the progress of those who were qualified has been seriously interfered with by the sifting out of those who could not go on.

"The trustees are the more earnest in calling attention to this lack of elementary preparation, because it has been found to be the most serious obstacle to the scientific and technical education of a very large proportion of the young men of New York engaged in mechanical pursuits.

"A brief statement of the results of the free night classes of the year just closed will confirm these observations:

The total number	admitted in Mathematics is	432
"	" remaining at the end of the term is	109
"	" admitted in Natural Philosophy	276
"	" remaining at the end of the term	58
"	" admitted in Elementary Chemistry	97
"	" remaining at the end of the term	22
"	" admitted in Applied Chemistry	35
"	" remaining at the end of the term	21
"	" admitted in Free-Hand Drawing	582
"	" remaining at the end of the term	332
"	" admitted in Architectural Drawing	126
"	" remaining at the end of the term	53
"	" admitted in Mechanical Drawing	160
"	" remaining at the end of the term	83

"Whence it appears that in the night schools of Science and Art 1,757 pupils in all were admitted during the term which has just closed, of which only 678 remained at the close. Of course some of this falling off is due to the migratory nature of the working classes, but it will be observed that the loss is greatest in those branches which require good mathematical preparation, and the experience of teachers in their intercourse with the pupils all goes to show that the chief obstacle to progress and a far larger measure of success in imparting a technical education is the total want of preparation in the ordinary rules of arithmetic."

We will add, in this connection, that Wm. G. Plympton has been appointed Professor of Natural Philosophy and Mechanism to this Institution, and delivered his inaugural address on the 30th October. These lectures will be continued in the Mechanical Lecture Room every evening of the week except Saturday and Sunday, at 7½ P. M. Free to all.

THE HIGHEST PRIZE AWARDED AT THE AMERICAN INSTITUTE.

This prize, a gold medal of honor specially struck for the occasion, has been awarded to Mr. James Lyall, the inventor and exhibitor of the Positive Motion Loom at the recent National Exhibition of the American Institute. It is the first of this kind ever awarded. It can only be given in accordance with the following by-laws:

The highest prize at any exhibition shall be the large Medal of Honor, which shall be given only for a new and useful invention, or for a new and highly valuable product of the soil never before exhibited. This prize shall be awarded only to the originator of such invention or product.

The large Medal of Honor designating the highest prize shall not be awarded by the managers for any article, unless its practical value shall exceed that of any similar one in use known to the managers, or intended to accomplish the same purpose.

It will be seen that to obtain this medal any invention must compete with all existing inventions designed to accomplish the same end, and that the prize awarded to this loom is one of no ordinary character. We are glad to see this invention fulfilling the predictions we made for it in our descriptive article in No. 2, current volume. It is doubtless desired to become historical among American inventions.

OBITUARY.---GEORGE PEABODY.

The death of George Peabody, which occurred on the evening of November 4th, at his residence in London, will be lamented in both hemispheres. Our readers are perfectly familiar with the princely benefactions this benevolent man has made to the poor of London and for educational purposes in his native land. He was born at Danvers, Mass, Feb. 18, 1795. He visited the United States for the last time in June of the present year, during which visit he made an additional gift to the cause of education in the South. A single line of the American poet, Holmes, expresses not only the character of this great hearted man, but the affectionate esteem with which he was universally regarded,

"The friend of all his race; God bless him!"

An excellent portrait of Mr. Peabody was published on page 181, Vol. XVI., of this journal.

Oersted's Discovery of Electro-magnetism.

Our readers having read a communication from Dr. Adolph Ott, denying the claims of Oersted to this discovery, will be interested in the perusal of the following account of it given in the last volume of the "Report of the Smithsonian Institute," which is as follows:

"What at the present day is of most import to the memory of Oersted in relation to this work, is perhaps the palpable proof found therein of his ceaseless preoccupation with the subject of electrical phenomena. He had conferred great improvements on the pile; he was one among the most practiced experimenters in employing it; he had formally indicated magnetism as one of the phenomena of which it would some day furnish the explanation, and no one was better prepared than himself to advance to the practical realization of this new conquest.

"Yet all the attempts thus far made had remained unfruitful. The expedient had been tried of placing the two poles of a battery as highly charged as possible in a parallel line with the poles of a strongly magnetized needle; no effect, however, had been produced. Nevertheless, the conviction still prevailed, especially with Oersted, that a relation must exist between galvanism and electricity. The route to the discovery was unknown, though hazard might open it unexpectedly.

"Fortune, it might be said, ceased to be blind at the moment when to Oersted was allotted the privilege of first divining that it was not electricity in repose accumulated at the two poles of a charged battery, but electricity in movement along the conductor by which one of the poles is discharged into the other, which would exert an action on the magnetized needle. While thinking of this—it was during the animation of a lecture before the assembled pupils—Oersted announces to them what he is about to try; he takes a magnetic needle, places it near the electric battery, waits till the needle has arrived at a state of rest; then seizing the conjunctive wire traversed by the current of the battery, he places it above the magnetic needle, carefully avoiding any manner of collision. The needle—every one plainly sees it—the needle is at once in motion. The question is resolved. Oersted has crowned, by a great discovery, the labors of his whole previous life.

"It was on the 21st July, 1820, that Oersted communicated to learned Europe the important fact with which his genius had just enriched science. He consigned it to a small tract written in Latin, of only four pages in 4to, which, notwithstanding its conciseness, presented with perfect clearness, the results of more than fifty experiments, and left scarcely anything to be added on the subject. This composition, entitled *Experimenta circa effectum*, etc.—(Experiments on the effect of the electrical conflict upon the magnetic needle)—was addressed the same day by post to all the societies in Europe which occupy themselves with the natural sciences. A French translation of it appeared in the number of the *Annales de chimie et de physique* for August, 1820, from which I transcribe a few expressions employed by Oersted on this occasion.

"The first experiments on the subject I undertake to explain were made in the lectures which I gave last winter on electricity and magnetism. They evinced in general, that the magnetic needle changed its direction through the influence of the voltaic apparatus, and that this effect took place when the circuit was formed, and not when it was interrupted; a process which had been attempted in vain by celebrated physicists, some years before. But, as my experiments had been made with an apparatus of small energy, the effect of which was not so striking as was called for by the importance of the fact to be established, I invited my friend Esmarch, judicial councillor to his Majesty, to unite with me in repeating them with a more powerful apparatus. We had also for associates and witnesses, the Chevalier de Vlengel, MM. Hauch and Reinart, professors of natural history; Jacobson, a very skillful physician and chemist, and Zeise, professor of philosophy. I made other experiments when alone, and if these taught me anything new, I took the precaution of repeating them in the presence of these eminent men of science.

* * * In order to make the experiment, we put in communication the opposite poles of the voltaic apparatus by a metallic wire, which we will call, for brevity, the *conducting* or *conjunctive wire*; and we will designate the effect, which is manifested in this conductor and around it during the voltaic action by the term *electric conflict*.

"Let us suppose now that the rectilinear part of this wire is horizontal, and placed above and parallel to a magnetic needle freely suspended * * * the latter will move in such a manner that, under the part of the conjunctive wire which is nearest to the negative pole of the apparatus, it will deviate towards the west. * * * If the conjunctive wire is arranged horizontally *under* the needle, the effects are of the same nature with those which take place when the wire is above the needle; but they act in an inverse direction—that is to say, the pole of the needle, under which is the part of the conjunctive wire that receives the negative electricity of the apparatus, inclines towards the east. * * * It appears, from the facts stated, that the electric conflict is not inclosed in the conducting wire, but that it has around it quite an extensive sphere of activity. We may conclude from the observations that this conflict acts by a vortical or whirling movement."

WOOD-PAPER MANUFACTURING CASE.

UNITED STATES SUPREME COURT. APPEAL FROM THE CIRCUIT COURT FOR THE EASTERN DISTRICT OF PENNSYLVANIA. OCT. 30, 1869.

The American Wood-Paper Company, Appellant, vs. *Jacob D. Heff, S. A. Rudolph, and John W. Dixon.*—The American Wood-Paper Company, incorporated by the Legislature of Rhode Island, is the assignee of the English and French improvements for the manufacture of paper from wood (by boiling in caustic alkali until reduced to pulp), and of an American improvement in boilers for that use, under patents taken out in this country, which it is claimed the appellees have infringed, by manufacturing and selling paper and paper pulp manufactured by the descriptions set forth, and by means of processes and machinery described in the specifications annexed to the letters patent. The bill sought to restrain the appellees, a Philadelphia firm, from the manufacture of such paper and pulp, and prayed that all infringing paper or pulp in their possession be destroyed or delivered up to the appellant.

In the Circuit Court, Mr. Justice Grier held that so far as the alleged improvements in boilers were new and patentable, they had not been infringed; that the reissued patents for the English improvements were illegal and void, having been obtained on the false pretence of seeking a correction on the specification, when the real invention was to change the invention; that the French improvement was not infringed, because the process used by the appellees did not require the minimum pressure to the square inch employed by the patent.

Mr. Justice Cadwalader concurred with Mr. Justice Grier, in respect of the two former patents, but thought there had been an infringement of the latter. This difference of opinion, however, did not save the case of the appellant, and the case was dismissed in order to enable the Company to appeal.

Harrison B. Mead, of Fort Edward, Washington county, N. Y., now intervenes, and moves that the appeal be dismissed, alleging that it now presents only a feigned issue, the controversy having been composed between the parties to it since the decree of the Circuit Court. It is averred that the appellees have no further interest in the matter, having been indemnified by the appellant, and that the suit is now carried on for the purpose of obtaining a judgment in this court on which to found an application for an injunction against a large number of persons in the manufacture of paper by a similar process for alleged infringements of one or more of the improvements whose validity is at issue in this cause, one of whom is the intervenor, and against whom this Company has brought suit by a complaint precisely like the bill at bar.

Proof to sustain the motion having been taken, it was now argued.

Gen. B. F. Butler for the motion; T. A. Jenkes, opposed.

MANUFACTURING, MINING, AND RAILROAD ITEMS.

The Mechanics' Institute Exhibition of San Francisco closed on the evening of October 30. The receipts were over $61,000.

A company has been organized in Kalamazoo, Michigan, with a capital stock of $100,000, for the manufacture of railroad cars.

A Russian engineer has run a railway train successfully from Charff to Kutschigan, a distance of 53·6 miles, the only fuel applied being raw commercial naphtha.

The Hartford and New Haven Railroad Company have commenced to erect their new freight building on Belle dock, New Haven. It is to be 300 feet long by 40 broad.

The Association for the Promotion of the Industry of Prussia offers a premium of $225 for the preparation of an enamel on cast iron, of variegated colors unaffected by exposure to air, which has proved effectual for at least a year.

It is stated that by melting copper in plumbago crucibles previously lined inside with pipe-clay and dried, non-porous castings may be obtained. As soon as copper, while in a molten state, is in contact with coal, or carbonaceous matter, it yields a porous and spongy casting.

From the report of the amount of trade between the United States and foreign countries it appears that England figures for the enormous total of $190,456,700 of our exports. The British Empire, in all, receives our exports to the amount of $230,000 000. Spain and all her possessions get $22,500,000, of which Cuba has $12,600,000. Liberia has the least viz., about $70,000. Of all that we send out, $275,753,000 are shipped in foreign, and but $138,201,636 in American vessels.

The directors of the *Services Maritimes des Messageries Impériales* have announced that the steamship Godavery will be dispatched from Marseilles on the 10th of November, to Port Said where she is expected to arrive on the eve of the inauguration of the Suez canal. After the opening ceremony she will pass through the canal on her voyage direct to Calcutta. The length of the Godavery is 305 feet, her burden 1,380 tuns, and her draft with full cargo 17 feet 9 inches.

Between May 10, 1865, and May 9 of the succeeding year, a passenger on the road of the Hudson River Railroad Company, between the New York station and Spuyten Duyvil, had to pay, on five hundred and twenty-six occasions, a few cents above the fare legally due to the company. Each time he protested against the overcharge, and thus reserved to himself the privilege of prosecuting. On May 9, 1866, he brought an action against the railroad company, and a decision has recently been given by the Hon. Chas P. Kirkland, the referee in the case, awarding damages covering the sum illegally collected, and fifty dollars each time an overcharge was paid amounting in all to about $26,315.

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U. S. Patent Office.

How to Obtain Letters Patent
FOR
NEW INVENTIONS.

Information about Caveats, Extensions, Interferences, Designs, Trade Marks; also, Foreign Patents.

FOR a period of nearly twenty-five years, MUNN & CO. have occupied the position of leading Solicitors of American and European Patents, and during this extended experience of nearly a quarter of a century, they have examined not less than fifty thousand alleged new inventions, and have prosecuted upwards of thirty thousand applications for patents, and, in addition to this, they have made, at the Patent Office, over twenty thousand preliminary examinations into the novelty of inventions, with a careful report on the same.

The important advantages of MUNN & CO.'S Agency are, that their practice has been ten-fold greater than any other Agency in existence, with the additional advantage of having the assistance of the best professional skill in every department, and a Branch Office at Washington, which watches and supervises, when necessary, cases as they pass through official examination. MUNN & CO. ask Special Attention to their

SYSTEM OF DOING BUSINESS.

CONSULTATIONS AND OPINIONS FREE.

Those who have made inventions and desire to consult with us are cordially invited to do so. We shall be happy to see them in person at our office, or to advise them by letter. In all cases, they may expect from us an HONEST OPINION. For such consultations, opinion, and advice, WE MAKE NO CHARGE. A pen-and-ink sketch and a description of the invention should be sent.

TO APPLY FOR A PATENT,

A model must be furnished, not over a foot in any dimension. Send model to MUNN & CO., 37 Park Row, New York, by express, charges paid, also, a a description of the improvement, and remit $16 to cover first Government fee, and revenue and postage stamps.

The model should be neatly made, of any suitable materials, strongly fastened, without glue, and neatly painted. The name of the inventor should be engraved or painted upon it. When the invention consists of an improvement upon some other machine, a full working model of the whole machine will not be necessary. But the model must be sufficiently perfect to show with clearness the nature and operation of the improvement.

PRELIMINARY EXAMINATION

Is made into the novelty of an invention by personal search at the Patent Office, which embraces all patented inventions. For this special search and report, in writing, a fee of $5 is charged. This search is made by a corps of examiners of long experience.

MUNN & CO. wish it distinctly understood, that inventors who employ them are not required to incur the cost of a preliminary examination. This examination is only advised in more doubtful cases.

COST OF APPLICATIONS.

When the model is received, and first Government fees paid, the drawings and specification are carefully prepared and forwarded to the applicant for his signature and oath, at which time the agency fee is called for. This fee is generally not over $25. The cases are exceptionally complex if a higher fee than $25 is called for, and upon the return of the papers, they are filed at the Patent Office to await Official examination. If the case should be rejected for any cause, or objections made to a claim, the reasons are inquired into and communicated to the applicant, with sketches and explanations of the references; and should it appear that the reasons given are insufficient, the claims are prosecuted immediately, and the rejection set aside, and usually with **No Extra Charge to the Applicant.**

MUNN & CO. are determined to place within the reach of those who confide to them their business, the best facilities and the highest professional skill and experience.

The only cases of this character, in which MUNN & CO. expect an extra fee, are those when appeals are taken from the decision of the Examiner after a second rejection; and MUNN & CO. wish to state very distinctly, that they have but few cases which can not be settled without the necessity of an appeal; and before an appeal is taken, in any case, the applicant is fully advised of all facts and charges, and no proceedings are had without his sanction; so that all inventors who employ MUNN & CO. know in advance what their applications and patents are to cost.

MUNN & CO. make no charge or prosecuting the rejected claims of their own clients before the Examiners; and when their patents are granted, the invention is noticed editorially in the SCIENTIFIC AMERICAN.

REJECTED CASES.

MUNN & CO. give very special attention to the examination and prosecution of rejected cases filed by inventors and other attorneys. In such cases a fee of $5 is required for special examination and report, and in case of probable success by further prosecution, and the papers are found tolerably well prepared, MUNN & CO. will take up the case and endeavor to get it through for a reasonable fee, to be agreed upon in advance of prosecution.

CAVEATS

Are desirable if an inventor is not fully prepared to apply for a Patent. A Caveat affords protection, for one year, against the issue of a patent to another for the same invention. Caveat papers should be carefully prepared

The Government fee on filing a Caveat is $10, and MUNN & CO.'s charge for preparing the necessary papers are usually from $10 to $12.

REISSUES.

A patent when discovered to be defective, may be reissued by the surrender of the original patent, and the filing of amended papers. This proceeding should be taken with great care.

DESIGNS, TRADE MARKS, AND COMPOSITIONS

Can be patented for a term of years, also, new medicines or medical compounds, and useful mixtures of all kinds. When the invention consists of a medicine or compound, or a new article of manufacture, or a new composition, samples of the article must be furnished, neatly put up. Also, send us a full statement of the ingredients, proportions, mode of preparation, uses, and merits.

PATENTS CAN BE EXTENDED.

All patents issued prior to 1861, and now in force, may be extended for a period of seven years upon the presentation of proper testimony. The extended term of a patent is frequently of much greater value than the first term; but an application for an extension, to be successful, must be carefully prepared. MUNN & CO. have had a large experience in obtaining extensions, and are prepared to give reliable advice.

INTERFERENCES

Between pending applications before the Commissioners are managed and testimony taken; also, Assignments, Agreements, and Licenses prepared. In fact, there is no branch of the Patent Business which MUNN & CO. are not fully prepared to undertake and manage with fidelity and dispatch.

FOREIGN PATENTS.

American inventors should bear in mind that five Patents—American, English, French, Belgian, and Prussian—will secure an inventor exclusive monopoly to his discovery among ONE HUNDRED AND THIRTY MILLIONS of the most intelligent people in the world. The facilities of business and steam communication are such, that patents can be obtained abroad by our citizens almost as easily as at home. MUNN & CO. have prepared and taken a larger number of European Patents than any other American agency. They have Agents of great experience in London, Paris, Berlin, and other Capitals.

A Pamphlet, containing a synopsis of the Foreign Patent Laws, sent free.

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Recent American and Foreign Patents.

Under this heading we shall publish weekly notes of some of the more prominent home and foreign patents.

CLOTHES MANGLE.—Hamilton E. Smith, New York city.—This invention relates to a new clothes mangle, which is so arranged that a suitable degree of pressure can be brought to bear on the clothes or other articles that are wound upon a roller, and so that no pressure or power is uselessly expended on the roller that carries the clothes, and to obtain continuous action in one direction.

MILK AND LIQUID COOLER.—A. P. Bussey, Westernville, N.Y.—This invention relates to a new apparatus for cooling milk and other liquids, and is more particularly adapted to the use of dairymen for cooling the milk in the cans in which it is transferred, and for keeping it cool while being conveyed.

MACHINERY FOR PROPELLING SMALL BOATS.—Virgil Dresser, Leavenworth, Kansas.—This invention relates to a new device for rotating by muscular-power paddle wheels that are hung on flat boats or other small vessels, and consists in the application of an oscillating lever which has a double set of pawls pivoted to it, to engage into ratchet wheels mounted on the paddle-wheel shaft.

NOZZLE AND SCREW CAP.—Alexander N. Lapierre, New York city.—This invention relates to a new method of constructing the nozzles and caps of cans for returning oil and other liquid matter, and has for its object cheapness of arrangement and convenience of operation. The invention consists in providing a vent for the discharge and entry of atmospheric air, and in the arrangement of a washer, which is secured to the cap, and closes the vent and nozzle.

HORSE-POWER FIRE ENGINE.—John C. McCarthy, New York city.—This invention relates to a new manner of constructing fire engines with a view of facilitating their operation where man or steam power cannot be readily obtained. The invention consists in the application of an endless apron, or other horse power, to a fire engine, so that horses on the engine or near it may operate its pump work for extinguishing fires.

APPARATUS FOR DRYING LUMBER.—F. I. Norton, Fremont, Ohio.—The object of this invention is to construct a kiln for drying lumber by means of steam and dry heat produced by steam. The invention consists chiefly in arranging a series of doors within the kiln, which doors when let down will close one or more chambers, into which the steam is discharged, while they will, when swung up, open said chambes, so that the steam may freely enter the kiln.

FREEZER.—Paul Schumacher, New York city.—This invention relates to a new apparatus which can be used for freezing ice cream and other suitable substances. The object of the inventon is to obtain a proportionately large cooling surface to the quantity of the material to be cooled.

SKIN AND OTHER GARMENTS OF CLOSE TEXTURE.—H. E. Smith, New York city.—This invention consists in providing such garments with perforations to permit the escape of the insensible perspirations and other emanations of the body, to maintain a more healthy condition thereof than can be done when these garments are worn in the common way.

SURGICAL INSTRUMENT.—P. J. Frank, Ashford, N. Y.—The object of this invention is to provide a simple and efficient instrument for depositing medicine under the skin for the treatment of "hernia."

COMPOUND WHEEL AND AXLE.—B. F. Leet. Dayton, Nevada.—This invention relates to new and useful improvements in wheels and axles for railroad cars, whereby it is designed to provide a simple and strong arrangement of independently revolving wheels, calculated also to utilize the wheels and axles now in use by removing one of the fixed wheels and substituting a loose wheel according to the improvement, which consists in the application to the common railroad car axle, having a solid collar shrunk on at the center of wheels having hollow stems projecting from the inner faces to the said collars, and held in place by loose sleeves made in two parts, having interval flanges which engage behind shoulders of projecting rims on the inner ends of the stems and hold them against the ends of the collars shrunk on the axles.

WATER-WHEEL GOVERNOR.—J. A. Whitman, Auburn, Me.—This invention consists of a combination with the driving mechanism for the governor, the gate operating devices and the governor of a double-acting vibrating pawl, under an arrangement whereby it is changed to work the rachet connected with the gate operating devices either way, the said pawl being worked by the direct action of the governor-drawing mechanism, thereby relieving the governor of all labor except the changing of the pawl. The invention also comprises an improved construction of the governor where by the resistance of the air upon a pair of pendant-hinged revolving wings is made use of mainly for working a vertically sliding hub on a revolving spindle, to obtain the required reciprocating motion.

FIRKINS AND TUBS FOR BUTTER AND OTHER SUBSTANCES.—D. M. Lockridge, Atto, N.Y.—The object of this invention is to provide firkins, tubs, and other vessels for packing butter, lard, and other like matters, by which access may be had to the contents for inspection without the labor of loosening the hoops and removing the head, which allows the brine to run out, greatly to the disadvantage of the butter as to preservation.

COMBINED SHOW CASE AND SAMPLE CARD FOR SPOOLED SILK, ETC.—Wm. G. Kelly, Oneida Community, Oneida, N. Y.—This invention has for its object to furnish an improved show case, which shall be so constructed and arranged as to hold the spools securely in place during transportation, exhibit them to good advantage to display the variety of colors, and at the same time allow the spools to be conveniently taken out.

RAILROAD.—David Harrison, Fayette, Miss.—This invention has for its object to enable the cars to be run with safety at great speed, to give sure warning of their approach to a station, and to readily ascend steep grades, and which shall effect these objects in an easy, simple, and effective manner.

COPY HOLDER.—John S. Butler, Silver City, Idaho Ter.—This invention has for its object to furnish a simple and convenient copy holder, designed more particularly for compositors' use, which shall be so constructed and arranged that it may be placed between the upper and lower type cases, occupying little space and without covering up any of the type boxes.

MECHANICAL MOVEMENT.—D'Alembert T. Gale, Poughkeepsie, N. Y.—This invention has for its object to furnish an improved mechanical movement for operating a churn, or driving light machiney, which shall be simple in construction, effective in operation, and convenient in use.

CAR COUPLING.—Manuel Van Slyke and D. W. Wood, Rome, N. Y.—This invention has for its object to furnish a simple, convenient, safe, and reliable car coupling, which shall be so constructed and arranged that it will be self-coupling, and may be uncoupled from the side or top of the car without its being necessary to go between the cars for that purpose.

TRUSS.—G. Mayer, Sullivan, Ill.—This invention relates to improvements in trusses, and has for its object to provide a simple, cheap, and efficient construction, and an adjustable arrangement for the pads, to be either worn singly or double, and adapted for males or females.

UNIVERSAL SHAFT COUPLING.—Wilfred P. Dugdale, Goshen, Ind.—This invention relates to improvements in shaft couplings, such as are used for coupling shafts when required to run out of a right line, and has for its object to provide a coupling of simple and cheap construction, which may be readily connected or disconnected, and having no projecting parts such as screw bolts, liable to catch into the clothing of attendants, and gather straws, etc., and designed more especially to be used with thrashing machines and applicable to other uses.

SAP FEEDER.—Geo. D. Chandler, West Concord, Vt.—This invention consists in a float, having a stem hinged to the faucet, and so arranged that when the surface of the sap in the kettles, whereon the float rides, falls, it will open a passage from the faucet allowing the sap to flow until it rises sufficiently to press the said stem, which is provided with a cork, or other suitable packing, against the mouth of the orifice with sufficient force to close the passage.

LEATHER PUNCHES.—John Lyle, Newark, N. J.—This invention relates to improvements in hand-spring leather punches, having a number of punches of various sizes arranged on an adjustable hub, connected to one end of one of the jaws; and the invention consists in an improved arrangement of the hub, for connection with the said jaw, whereby it is held more securely in position against the tendency to turn when punching.

CUT-OFF FOR PIPES.—James H. Perkins, Omaha, Neb.—This invention consists in the application to the conductors, where two sections are joined by an oblique connection, the one sliding into the other and arranged to have an opening at one side of a hinged spout, so shaped and arranged that where the water is required to pass down to the cistern it may be folded up against the side closing the lateral orifice, and when it is required to shut the water off and spout it through the lateral opening it may be readily turned down and arranged to cut off the direct passage below, and chute the water into other conductors, the same hook holding it in either position.

PACKING AND TRANSPORTING BUTTER.—J. Thayer, Palmyra, Wis.—This invention relates to a new and improved method of packing and transporting butter for sale and use.

SPRING BED BOTTOM.—F. F. Lahm, Chicago, Ill.—This invention relates to a new and useful improvement in spring bottoms for beds and sleeping couches, and consists in the springs, and in the construction and arrangement of parts.

CULTIVATOR.—W. T. Baker, Lancaster, Texas.—This invention relates to a new and useful improvement in machines for cultivating the ground, and it consists in the manner of hanging and regulating the cultivator plows.

SPECTACLES.—Louis Black, Detroit, Mich.—This invention relates to a new and useful improvement in spectacles whereby the glasses, or either of them, may be readily removed and other glasses inserted.

HOOP MACHINE.—William Lawyer, Macomb, N. Y.—This invention relates to a new and useful improvement in machines for facilitating the manufacture of hoops, having particular reference to the process called "rack ing."

DRAFT REGULATOR.—J. J. Smith and Samuel Wood, Cleveland, Ohio.—This invention consists in the use of a column of mercury in an open tube which is subject to both steam and atmospheric pressure, in combination with suitable mechanism for operating upon draft dampers and also for acting upon the safety valve.

HAY MAKING, LOADING, AND STACKING MACHINE.—B. J. Moore, Dresbach, Minn.—The object of this invention is to provide a simple, cheap, and effective machine which may be used for spreading hay, or raking, loading, or stacking it, and it consists in an improved arrangement of the truck for supporting and moving the several parts, and imparting the motion to an elevator; also, in an arrangement for raising an endless elevator, employed for taking the hay from a rake and delivering it on a platform, when required to be out of action; also, an improved construction and arrangement of the rake, for facilitating the independent action of the teeth, and the elevation of the rake above the working position.

KNITTING MACHINE.—H. C. Work, Philadelphia, Pa.—This invention consists of an improved method of taking the loops on the needles or hooks off, for the reception of the new loops, and for discharging them over the said new loops by means of pins sliding up in grooves on the hooks just previous to the going down of the hooks with the new loops. The invention also comprises a means of operating both the hooks and the sliding pins by one cam on the cylinder, and it also consists of an improved arrangement of yarn guide in connection with the pawls for turning the cam.

REFLECTOR.—Samuel Meadows, Toronto, Canada.—The object of this invention is to provide a glass reflector having the glasses so arranged as to have greater power than those now in use, and so that portions of the reflecting parts may be adjusted to throw the light on any given point, and also so arranged in respect of the frame for the support of the glass that the same may be easily and cheaply put together and parts removed for the substitution of other glasses when broken.

PROCESS FOR RESTORING AND PRESERVING BUTTER.—Calvin Peck, Marshall, Ill.—This invention and discovery relate to a new and useful improvement in a process for purifying and preserving butter, having especial reference to arresting fermentation, and restoring and preserving rancid butter.

MACHINE FOR MAKING CHAIR SEATS.—Joseph C. McCormick, Smicksburg, Va.—The object of this invention is to provide for public use a simple, convenient, and effective machine for cutting out and molding curved seats for common wooden chairs.

PROCESS OF RESTORING DECAYED RAILROAD TIES TO THEIR ORIGINAL DURABILITY.—Wm. Dripps, Coatesville, Pa.—It is the practice on railroads when making a general repair to take up all the ties though seven eighths of them may be good, provided they could be prevented from becoming any more decayed and unserviceable, to prevent decay and restore to such worthless ties an intrinsic value, and to prevent the loss of ties only partially deteriorated is the object of this invention.

STOVES.—Asa Snyder, Richmond, Va.—This invention relates to stoves for heating or cooking purposes, having hollow-walled fire chambers, and hollow grates, and perforations in the inner walls of the fire chambers for conducting air in a heated condition to the fire.

SAFETY CAN.—M. H. Barnes, Peoria, Ill.—This invention has for its object to prevent the access of flame to the explosive vapor that always fills the empty portions of cans partially full of oil, so that the can may be safely used to supply lighted lamps, or brought into any proximity, however close, with flame, without danger of exploding.

REMOVING DUST FROM THRASHING MACHINES.—Era Rose, Vernon, Ind —The object of this invention is to provide for use in connection with thrashing machines, a simple, cheap, and convenient apparatus which can be employed to take up and remove the dust from the thrashing apparatus delivering it outside of the building in which the machine is used, or in any other convenient place.

CAR BRAKE.—S. R. Stinard, Paterson, N. J.—This invention relates to improvements in the mode of operating brakes for retarding or stopping railroad cars or trains of cars, having particular reference to brakes which are made to act by means of steam, or compressed air, or other elastic fluid and which are under the control of the engineer, but at the same time not interfering with the operations of the hand brake of each car; and the invention consists in applying mechanism for taking up, or compensating for the "slack," or play, between the cars of a train.

FURNACE FOR MELTING AND DECABONIZING IRON.—Charles Peters. Trenton, N. J.—This invention relates to a new and useful improvement in melting, decarbonizing, and desulphurizing iron, and consists in melting the iron at the top of the stack, or cupola, and dropping the melted iron through a column of flame, and on to a solid cone, or bed, whereby the globules of iron are burst, and, in supplying oxygen, or atmospheric air to the iron on, or near, the cone or bed.

STEAM ENGINES.—J. M. Davidson, Napoleon, Ark.—This invention relates to a new and useful improvement in steam engines, blowing cylinders and all other machinery where cylinders and pistons are used, and it consists in so constructing the piston and piston rod, and so connecting the rod with the cylinder head, that a pitman, or connecting rod, and cross head is dispensed with.

HEATER.—H. Stickney, Cleveland, Ohio.—This invention relates to improvements in base burning heaters, having for its object to provide certain improvements in the construction and arrangement of the base and in the application of water vessels around the same; also, an improved radiating apparatus; also an improved valve arrangement in the magazine for preventing the escape of the gas therefrom, and for admitting the supply of coal; also an improved means for operating the grate to discharge the ash and cinder; and also, an arrangement for closing the draft door by the action of the feed door in opening to prevent the escape of gas when supplying the magazine.

COWLS FOR CHIMNEYS AND SHAFTS.—Edward Hewett, St. Leonard's-on-Sea, England.—This invention relates to improvements in the construction of cowls to be applied to chimneys and furnace shafts, whereby an efficient up draft is obtained and all down draft at the same time prevented.

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RIBBON CASE.—George F. Woolston, Marshalltown, Iowa.—The object of this invention is to provide a safe and convenient method of keeping ribbons for retail and for measuring the same as they are sold, the arrangement being more especially designed for velvet and other expensive ribbons.

PRESERVATION OF METALS.—A patent was recently granted to John Carson and Daniel Breed, of Washington city, for manufacturing, tempering, and preserving metals in a state of insulation from earth currents of electricity, in order to prevent crystallization, and to produce and retain the metal in a superior fibrous condition. In the practical application of the invention, it is necessary to insulate the foundation of the furnace, the hammers, anvils, floors for the workmen, furnace tools, rollers, and machinery, molds, forges, and all appliances for working metals and tempering edge tools, store houses and racks where metals are kept, and every place and thing in contact or connection with the metal. Also, railroads, bridges, building, and other structures made of iron in whole or in part should be insulated. For the purpose of insulation glass tiles, balls, pillars, or any other suitable means may be employed. Upon railroads a board of gutta-percha, or other bad conductor, may be placed between the ties and rails, and also under the chairs, or under the rails, upon the chairs, thus forming an insulating, elastic cushion for the rails, and thereby preventing the usually severe concussion of the rolling stock. The invevtion may be applied not only to iron and steel, but also to copper, brass, and others metals and alloys where it is desirable to secure a highly fibrous condition, and prevent or retard crystallization.

HATCHWAY GUARD.—Henry H. Covert, New York city, assignor to himself and James F. Sullivan, Brooklyn, N. Y.—This invention relates to improvements in guards for hatchways in buildings, and has for its object to provide a removable safety guard, for the prevention of accidents to persons by inadvertently stepping over the edges of openings in the floors and falling through.

Answers to Correspondents.

CORRESPONDENTS who expect to receive answers to their letters must, in all cases, sign their names. We have a right to know those who seek information from us; besides, as sometimes happens, we may prefer to address correspondents by mail.

PECIAL NOTE.—This column is designed for the general interest and instruction of our readers, not for gratuitous replies to questions of a purely business or personal nature. We will publish such inquiries, however, when paid for as advertisemets at $1·00 a line, under the head of "Business and Personal."

All reference to back numbers should be by volume and page.

W. M., of N. Y.—A good steam gage should indicate the exact pressure per square inch in the boiler. The amount of steam at 212 which steam at higher temperature would make, may be at once computed from the pressure and the space it occupies. For formulæ to do this we refer you to Bourne's "Catechism of the Steam Engine," page 85. What is meant by vacuum is the absence of any material thing. When two boilers are connected by a pipe of sufficient size, the pressure *per square inch* will be practically the same in each. This is what the gage indicates, not the sum of the pressures per square inch in each.

F. S., of Pa.—Formic acid was first found in the bodies of ants. It may be, however, prepared artificially. It takes its name from the Latin *Formica*, an ant. It may be made by distilling with care in a retort, ten parts of starch, by weight, with thirty-seven parts of peroxide of manganese, and oil of vitriol and water, each thirty parts. There are many other methods of producing this acid, but the method given can be employed on a small scale in a retort capable of holding ten or twelve times as much in the bulk of the mixture, as the latter is liable to froth when the heat is first applied.

E. W., of Ohio.—The electric light is an expensive one, requiring a very strong battery. The calcium light will answer your purpose better and will be much cheaper for magic lantern purposes. You will find the subject of Taxidermy treated in any good encyclopedia. You will find the smell of your stuffed pole cat so persistant as to probably spoil it for the cabinet. One of these animals ought not to be killed by violence if intended for stuffing. It is better to persuade him to contribute to science by a little arsenic adroitly secreted in an egg.

J. V. R., of N. Y.—To make soluble glass in small quantities, fuse together in a Hessian crucible, one part of clean sand or finely pulverized quartz, and two parts of dried carbonate of soda. When the fusion is perfect, pour out the mass on a stone slab to cool. Pulverize and treat with boiling water until all but the impurities are dissolved, then concentrate by evaporation in a porcelain capsule.

E. B., of Mass.—Portland cement concrete might doubtless be used to advantage in filling in the walls of frame buildings, In a building, the walls of which are already plastered, it would, however, require to be done with great care not to press off the plastering. To attempt to fill ten feet in depth at once would certainly destroy the walls. Not more than one foot could, in our opinion, be safely ventured upon.

G. L. P., of Saltillo, Mexico.—The sketch you send us of an instrument for measuring the flow of streams at different depths is simply a re-invention of an instrument devised by Pictot, and well known to hydraulic engineers in the United States and Europe. It is a good instrument, and that you should have reinvented it in the absence of any previous knowledge of it is creditable to your inventive talent.

J. Y., of N. Y.—Your request for us to furnish you with a design (for it amounts to that) for engines, screw, etc., for a boat 28 feet in length and 7 feet in width, designed to have a maximum speed of 8 miles per hour, would, if complied with, cost you about one hundred and fifty dollars. We prefer that some of the mechanical engineers whose advertisements appear in our columns should get this job.

R. D., of N. Y.—The recipe for hardening mill-picks to which you refer was as follows: Two gallons rain water, one ounce corrosive sublimate, one ounce sal ammoniac, one ounce saltpeter, one and one half pints rock salt. The picks should be heated to cherry red, hardened in the bath, and drawn to temper.

M. H. K., of Kan.—We do not know of any monograph on the subject of starch manufacture. If you could get access to "Muspratt's Chemistry" in some public library, you would find the subject very fully treated. It is also discussed at length in Dr. Ure's "Dictionary of Arts, Manufactures, and Mines.

R. A., of Pa.—We were not aware, till you informed us, that practical railroad men suppose the gravity of a train to be increased with its velocity, but we were well aware that what is called its "vis viva," increases as the square of its velocity. Is not that what you mean?

R. M. F., of Texas.—Capt. John Ericsson resides at 36 Beach street, New York. The other information you seek can be found in Appleton's Encyclopedia. Article "Oysters."

E. T. D., of Pa.—You may remove the oxide of copper from the surface of that metal by ammonia in case you do not wish to employ acids.

J. L. B., of Cal.—A patent can be obtained on your invention if it is what you state. We do not deal in patents and therefore must decline your proposition.

S. M., of Mich.—Your "new thing" in paper boxes is a good thing, and we think the claims are clearly patentable.

S. B., of Ill.—A liquid black varnish for stoves is sold in this market, and we presume you can find it in Chicago.

Business and Personal.

The Charge for Insertion under this head is One Dollar a Line. If the Notices exceed Four Lines, One Dollar and a Half per line will be charged.

Portland Cement, imported direct from the best English makers. Send for circular. J. E. Mitchell, 310 York Ave., Philadelphia.

The Watch—Its history, construction, how to choose and how to use it. Illustrated. This useful work, neatly bound, price, postpaid, 60c. Address the author, H. F. Piaget, Watch Repairer, 119 Fulton st., N.Y.

Photographic Printing. The patent on the apparatus of Jean Elie Richard, illustrated in last Scientific American, will be sold or licensed, in part or whole, on very reasonable terms. Address inventor. Sweeny's Hotel, New York.

Terra Cotta Statuary.—Manufacturers of Terra Cotta Statuary and vases, for ornamenting country places, are requested to send catalogues of their manufactures to the editor of this paper.

Fire Damp in Mines.—Parties who wish to join the Inventor of a Preventive for Fire Damp, in obtaining Patents in France, Belgium, England, and America, may address Robert Blacklidge, Bridgeport, Conn,

Grindstone shafts, with self-adjusting plates, will prevent Stones bursting. Made a specialty by J. E. Mitchell, 310 York ave., Phil'a.

Valuable Patent (combined Table and Cradle) for sale. Can be manufactured as a Toy, or an article of use. Will sell rapidly as either. Philadelphia Patent and Novelty Co., 717 Spring Garden st.

For Aluminum Bronze and Oroide Watches, Chains, and Jewelry, send to Oroide Watch Co., Boston, U. S. Price list sent free.

For Sale—A patent for a composition for covering steam boilers, pipes, etc. E. D. & W. A. French, 3d and Vine sts., Camden, N. J.

For tinmans' tools, presses, etc., apply to Mays & Bliss, Brooklyn, N. Y.

Mill-stone dressing diamond machine, simple, effective, durable. Also, Glazier's diamonds. John Dickinson, 64 Nassau st., New York.

For Sale—60-H. P. Engine and two large Tubular Boilers, first rate order. Will be sold cheap. N. D. Preston, Fulton, Oswego Co., N. Y.

Peck's patent drop press. For circulars, address the sole manufacturers, Milo Peck & Co., New Haven, Ct.

Send for a circular on the uses of Soluble Glass, or Silicates of Soda and Potash. Manufactured by L. & J. W. Feuchtwanger, Chemists and Drug Importers, 55 Cedar st., New York.

Manganese Ores suitable for glass, steel, oil boilers, at low prices. Muriatic Acid, full strength, price 1½ cents per lb. Soda Ash. Bleaching Powder, fresh made, full test, at market prices. Michigan Chemical Company, Jackson, Mich.

Shafting, Hangers, and Pulleys, Craig's Oscillating Steam Engines, on hand and to order. Gallatin & Brevoort Machine Works, 223 Front st., New York.

Glynn's Anti-Incrustator for Steam Boiler—The only reliable preventative. No foaming, and does not attack metals of boiler. Liberal terms to Agents. C. D. Fredricks, 587 Broadway, New York.

Chemicals, Drugs, Minerals, Metals, Acids, etc., for all Mechanics and Manufacturers, for sale by L. & J. W. Feuchtwanger, Chemists, and Importers of Drugs and Minerals, 55 Cedar st., New York.

Cold Rolled—Shafting, piston rods, pump rods, Collins pat. double compression couplings, manufactured by Jones & Laughlins, Pittsburgh, Pa.

For solid wrought-iron beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

Machinists, boiler makers, tinners, and workers of sheet metals read advertisement of the Parker Power Presses.

Diamond carbon, formed into wedge or other shapes for pointing and edging tools or cutters for drilling and working stone, etc. Send stamp for circular. John Dickinson, 64 Nassau st., New York.

Winans' boiler powder, 11 Wall st., N. Y., removes Incrustations without injury or foaming; 12 years in use. Beware of Imitations.

NEW PUBLICATIONS.

AMERICAN WHEAT CULTURIST. A Practical Treatise on the Culture of Wheat, Embracing a brief History and Botanical Description of Wheat with Full Practical Details for Selecting Seed, Producing New Varieties, and Cultivating on Different Kinds of Soil. With Engravings. By Edwards Todd, Agricultural and Horticultural Editor of the New York *Times*, Author of the "Farmer's Manual," etc. New York: Taintor, Brothers & Company, 678 Broadway.

This is a book from the pen of a well-known writer on agricultural matters, and it must find favor with the large class of farmers engaged in wheat growing in this country. It is a good sign for the future that such books as this can be published with the certainty that they will be purchased and read. The age for decrying what has been contemptuously styled "book farming" has passed, and farmers are beginning to see that ignorance is neither honorable nor profitable. This work is a record of forty years of experience in wheat growing by a man who had power to observe facts and trace them to causes. The author, in his preface, modestly recommends the work to the perusal of young farmers; but we are confident there are many old farmers who might read the work with profit.

THE ELEMENTS OF TACHYGRAPHY. Illustrating the First Principles of the Art, with their Application to the Wants of Literary, Professional, and Business Men, Designed as a Text-Book for Classes, and for Private Instruction. By Phillip Lindsay. Boston: Otis Clapp, 3 Beacon street.

This is a system of short writing not intended to meet the wants of reporters, but to supply the want long felt of a very much less laborious system of writing than that now in vogue. The phonographic system, although beautiful, philosophical, and extremely rapid, requires a much longer time in acquisition than that offered in this work, and with the practice possible to most literary men cannot be made more available than Mr. Lindsay's system, while the latter is so simple that its acquisition requires only a few hours study. We have examined this work with much care, and are satisfied from our own experience in the intricacies of phonography that it offers a legible, easy, and rapid substitute for the ordinary system of writing which will avail to lighten the burdens of literary workers immensely. It is perhaps too much to hope that such a system can be speedily and generally adopted for business purposes, but its advantages to business men become obvious to all who peruse Mr. Lindsay's treatise.

THE RURAL CAROLINIAN. Walker, Evans & Cogswell, Charleston, S. C. Terms, $2 per annum.

This is one of the best agricultural monthlies that comes to this office. Every number contains some eighty pages and a number of well-executed engravings of agricultural implements, and of new varieties of fruits and flowers. Its editorial discussions on the treatment of lands for cotton and other crops, the economy of various fertilizers, the best mode of application of manures, etc., render the publication of great practical value to the farmer and planter. We commend it to the patronage of agriculturists both North and South.

AMERICAN CATTLE, their History, Breeding, and Management. By Lewis F. Allen, late President of the New York State Agricultural Society, Editor of the "American Short-Horn Hand-Book," Author of "Rural Architecture," etc.

☞ This book is eminently practical in its character. The reputation of its author as a leading agriculturist, stock grower, and author, will recommend it at once to the favorable consideration of stock growers.

A TREATISE ON NAVAL ARCHITECTURE AND SHIP BUILDING, or an Exposition of the Elementary Principles Involved in the Science and Practice of Naval Construction. Compiled from Various Standard Authorities. By Commander Richard W. Meade, U. S. N. Philadelphia: J. B. Lippincott & Co.

This is a work intended as a text-book for the use of the students at the United States Naval Academy, but we are sure it must meet the wants of many professional as well as amateur constructors outside of naval schools The work is elementary in character, and its matter has been collected from the highest authorities. Among these may be mentioned Scott Russell, Rankine, Murray, Knowles, Fairbairn, Fishbourne, Marrett, and Peake. The work is a large octavo, printed and illustrated in excellent style. As a work of reference it will be found a useful addition to any library of technical works.

MANUAL OF ASTRONOMY. With a familiar Explanation of Astronomical Instruments and the Best Methods of Using them. By John Drew, F.R.A.S., Doctor in Philosophy of the University of Bale, Author of "Chronological Charts Illustrative of Ancient History and Geography." Second Edition. Philadelphia: J. B. Lippincott & Co.

This little work, though simple and elementary in its character, is the work not only of a distinguished scientist, but an experienced and successful instructor. The main facts of the science are therefore not only presented, but presented in the best manner. Many of our readers who have addressed us inquiries on various astronomical subjects will find them answered in a plain and attractive manner in this work. The portion of the work devoted to the construction and use of astronomical instruments will be found of especial interest to those who are not versed in practical astronomy. It contains nothing calculated to puzzle the most ordinary reader, as the special design of the work, has been to render the rudiments of astronomical science accessible to all.

Official List of Patents.

Issued by the United States Patent Office.

FOR THE WEEK ENDING NOV. 2, 1869.

Reported Officially for the Scientific American.

SCHEDULE OF PATENT OFFICE FEES:

On each caveat	$10
On filing each application for a Patent (seventeen years)	$15
On issuing each original Patent	$20
On appeal to Commissioner of Patents	$20
On application for Reissue	$30
On application for Extension of Patent	$50
On granting the Extension	$50
On filing a Disclaimer	$10
On an application for Design (three and a half years)	$10
On an application for Design (seven years)	$15
On an application for Design (fourteen years)	$30

In addition to which there are some small revenue-stamp taxes. Residents of Canada and Nova Scotia pay $500 on application.

For copy of Claim of any Patent issued within 30 years $1

A sketch from the model or drawing, relating to such portion of a machine as the Claim covers, from $1

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96,298.—SHOT POUCH.—A. F. Allen, Providence, R. I.
96,299.—HOISTING JACK.—Bruno Beuchel (assignor to himself and W. Rodiger), Kalamazoo, Mich.
96,300.—MODE OF MAKING THE BEDS OF BILLIARD TABLES.—W. B. Billings, Chicago, Ill. Antedated Oct. 29, 1869.
96,301.—MACHINE FOR SHAPING WOODEN TRAYS.—Henry Blake, Rindge, and A. J. Blake, Fitzwilliam, N. H.
96,302.—CHEESE BOX.—Frank Blecka, Elgin, Ill. Antedated Oct. 22, 1869.
96,303.—MATCH BOX.—John Bousfield, Cleveland, Ohio.
96,304.—CENTRIFUGAL MACHINE.—J. F. Brinjes, Fieldgate street, Whitechapel, England.
96,305.—SAW.—Ira S. Brown and C. N. Brown (assignors to themselves and J. M. Gross), Providence, R. I.
96,306.—CORN SHELLER.—H. W. Cornell, Oswego, N. Y.
96,307.—PUMP.—W. N. Chamberlain, Van Buren, Mich.
96,308.—BOLT BLANK.—J. B. Clark, Plantsville, Conn.
96,309.—TEAPOT HANDLE.—L. C. Clark, Plantsville, Conn.
96,310.—THREAD HOLDER AND CUTTER.—J. Cleary, Brooklyn, N. Y. Antedated Oct. 16, 1869.
96,311.—HARVESTER.—Wm. Cogswell, Ottawa, Ill., assignor to himself and W. H. W. Cushman.
96,312.—MILLSTONE DRIVER.—Solomon Darkess, Deerfield, Ind.
96,313.—APPARATUS FOR COATING CEMENT PIPES.—Edwin Dayton, Meriden, Conn.
96,314.—STUMP EXTRACTOR.—Edwin Fales, Lancaster, Mo.
96,315.—APPARATUS FOR EXTRACTING OIL FROM FISH.—W. H. H. Gloker, Southold, N. Y.
96,316.—MECHANICAL MOVEMENT.—M. A. Hardy, Cambridge, Mass.
96,317.—CATTLE FOOD.—John T. Harris, Tyngsborough, Mass.
96,318.—AXLE AND SHAFT.—W. H. Hawley, Utica, N. Y.
96,319.—COMBINED CORN PLANTER AND CULTIVATOR.—J. C. Hazen, West Independence, Ohio.
96,320.—LOOM.—J. G. Henderson, Keokuk, Iowa.
96,321.—BLUING COMPOUND FOR THE MANUFACTURE OF PAPER.—James Hogben, Cleveland, Ohio.
96,322.—COMBINED CULTIVATOR AND SEED PLANTER.—D. E. Holt, Wilkinson county, Miss.
96,323.—CORN AND COTTON-SEED PLANTER.—D. E. Holt, Wilkinson county, Miss.
96,324.—TROCHE.—S. E. Johnson, Jr., Brooklyn, N. Y.
96,325.—SASH SUPPORTER.—Peter Keffer (assignor to himself I. S. Hoyer, and S. A. Stout), Berks county, Pa.
96,326.—MEAT-CUTTING MACHINE.—Anton Kirn (assignor to himself and J. E. Krasselt), Buffalo, N. Y.
96,327.—ORE WASHER.—Kelley Le Beau, Chicago, Ill.
96,328.—HOT-AIR FURNACE.—W. H. Lee and C. M. Hardenbergh, Minneapolis, Minn.
96,329.—PUMP VALVE.—Thomas Ling, Hartford, Conn. Antedated Oct. 27, 1869.
96,330.—APPARATUS FOR PERFORATING PAPER FOR TELEGRAPHING.—George Little, Rutherford Park, N. J.
96,331.—APPARATUS FOR PERFORATING PAPER FOR TELEGRAPHING.—George Little, Rutherford Park, N. J.
96,332.—ELECTRO-MAGNETIC MOTOR.—George Little, Rutherford Park, N. J.
96,333.—AUTOMATIC TELEGRAPHIC APPARATUS.—Geo. Little, Rutherford Park, N. J.
96,334.—GANG PLOW CULTIVATOR.—H. P. McCleave, Tomales, Cal.
96,335.—HOT-AIR ENGINE.—Thos. McDonough, Newburgh, N. Y.
96,336.—REFLECTOR.—Samuel Meadows (assignor for one half to T. K. Morgan), Toronto, Canada.
96,337.—AXLE BOX.—David Metz, Washington, D. C.
96,338.—OVEN.—G. R. Moore, Philadelphia, Pa.
96,339.—SHEARS.—B. W. Nichols (assignor to Canton Malleable Iron Co.), Canton, Ohio.
96,340.—APPARATUS FOR MEASURING LIQUIDS.—P. Noyes, Lowell, Mass.

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96,341.—ELEVATED RAILWAY.—Augustus Olcott, Elizabeth, N. J.
96,342.—FIREPLACE GRATE.—James Old, Pittsburgh, Pa.
96,343.—CREASING ATTACHMENT FOR SEWING MACHINES.—Charles Page, Boston, Mass.
96,344.—CULTIVATOR.—F. L. Perry, Canandaigua, N. Y.
96,345.—SOLID OR DRY EXTRACT OF BARK FOR TANNING ETC.—John Pickles, Wigan, England, assignor to James Foley, John T. Harris, and W. W. Harris, Montreal, Canada.
96,346.—BED BOTTOM.—J. D. Pratt, Cleveland, Ohio.
96,347.—SEED SOWER.—T. J. Price, Macomb, Ill.
96,348.—SELF-LUBRICATING AXLE BOX.—S. S. Putnam, Dorchester, Mass.
96,349.—THILL COUPLING.—S. S. Putnam, Neponset, Mass.
96,350.—HARVESTER.—Amos Rank, Salem, Ohio.
96,351.—HARVESTER.—Amos Rank, Salem, Ohio.
96,352.—HARVESTER.—Amos Rank, Salem, Ohio.
96,353.—HARVESTER RAKE.—Amos Rank, Salem, Ohio.
96,354.—CIRCULATING GRATE FOR STEAM GENERATORS.—James Braden, Indianapolis, Ind., administrator of the estate of James Scanlan, deceased.
96,355.—FLOOR SET.—C. M. Shaw, Portland, Me. Antedated Oct. 22, 1869.
96,356.—FOLDING BEDSTEAD.—Gerard Sickels, Boston, Mass.
96,357.—COLUMN OR TUBE.—Frederick H. Smith, Baltimore, Md.
96,358.—PERFORATED WEARING APPAREL.—H. E. Smith, New York city.
96,359.—CLOTHES MANGLE.—H. E. Smith (assignor to Mary Jane Smith), New York city. Antedated Oct. 16, 1869.
96,360.—CLOTHES MANGLE.—H. E. Smith (assignor to Mary J. Smith), New York city. Antedated Oct. 22, 1869.
96,361.—CLOTHES MANGLE.—H. E. Smith (assignor to Mary J. Smith), New York city. Antedated Oct. 22, 1869.
96,362.—RAILWAY CATTLE CAR.—J. W. Street, Marshalltown, Iowa.
96,363.—WINDOW SCREEN.—J. A. Thorn, Chicago, Ill.
96,364.—APPARATUS FOR CARBURETING AND APPLYING AIR FOR LIGHTING AND HEATING.—Joel Tiffany, Albany, N. Y.
96,365.—MAKING TANNING AND DYEING EXTRACTS.—B. C. Tilghman, Philadelphia, Pa. Antedated Oct. 30, 1869.
96,366.—PENCIL ATTACHMENT TO COMPASS.—C. L. Tyler, Ithaca, N. Y.
96,367.—RING-STOPPER NIPPER.—Calvin Wardwell (assignor to himself and H. H. Coe), Painesville, Ohio.
96,368.—STEAM WATER ELEVATOR.—J. D. Warner, Brooklyn, N. Y.
96,369.—LOCK.—H. B. Weaver, Hartford, Conn.
96,370.—POTATO DIGGER.—G. W. B. Yocom, R. J. Walker, and Elias Sharp, Arcata, Cal.
96,371.—COMPOUND FOR THE CURE OF CANCER.—Mortimer Williams, Middletown, Ohio.
96,372.—MACHINE FOR THREADING BOLTS, ETC.—J. B. Wiggenhorn, St. Louis, Mo.
96,373.—CARTRIDGE.—Friedrich Wohlgemuth, New York city.
96,374.—MANUFACTURE OF CARBONATE OF SODA.—Otto Wuth, Pittsburgh, Pa.
96,375.—RAILWAY CAR BRAKE.—G. W. B. Yocom and Edward Cowan, Arcata, Cal.
96,376.—COMBINATION LOCK.—Moses Adams, Chilmark, Mass.
96,377.—WEATHER-BOARDING.—J. C. Anderson, Webster, Pa.
96,378.—MACHINE FOR GRINDING SEATS OF VALVES.—W. H. Anderson, Brooklyn, N. Y.
96,379.—CULTIVATOR.—W. T. Baker, Lancaster, Texas.
96,380.—SAFETY CAN.—M. H. Barnes, assignor to himself and E. P. Sloan, Peoria, Ill.
96,381.—MACHINE FOR WIRING BLIND SLATS, ETC.—Peter Barry, Newark, N. J.
96,382.—CULTIVATOR.—E. C. Bean and F. N. Welden, Rockford, Ill.
96,383.—FASTENING PLOWSHARES TO PLOWSTOCKS.—W. G. Beckwith, Lowndesborough, Ala.
96,384.—IRONING BOARD.—C. H. Bennett and W. A. Daggett, South Vineland, N. J.
96,385.—APPARATUS FOR EMPTYING PRIVY VAULTS.—J. G. Berger, Nuremberg, Bavaria.
96,386.—PORTABLE FIRE WALL.—J. F. Bishop, Afton, Iowa.
96,387.—SPECTACLE.—Louis Black, Detroit, Mich.
96,388.—FERTILIZER ATTACHMENT FOR PLOWS.—J. I. Boswell, Christiansville, Va.
96,389.—LUBRICATOR.—John Broughton, New York city.
96,390.—MILK COOLER.—A. P. Bussey, Westernville, N. Y.
96,391.—COPY HOLDER.—J. S. Butler, Silver City, Idaho Territory.
96,392.—SAP FEEDER.—G. D. Chandler, West Concord, Vt.
96,393.—FURNITURE CASTER.—Stephen Chandler, New York city. Antedated September 21, 1869.
96,394.—FAUCET.—W. P. Clark, Medford, Mass.
96,395.—APPARATUS FOR TRANSMITTING ROTARY MOTION.—Melville Clemens, Springfield, Mass.
96,396.—CHILD'S CARRIAGE AND VELOCIPEDE COMBINED.—J. C. Cline, Philadelphia, Pa.
96,397.—WASHING MACHINE.—J. D. Conner, Bloomington, Ill.
96,398.—HATCHWAY GUARD.—H. H. Covert, New York city.
96,399.—PLOW.—M. C. Cox, Bennettsville, S. C.
96,400.—CUT-OFF-VALVE GEAR.—William Dawes, Kingston Grove, Leeds England. Patented in England Jan. 5, 1869.
96,401.—MACHINE FOR MAKING EYELETS.—Adolph Delkescamp, Brooklyn, E. D., N. Y., assignor to J. D. Bacon for one third, and John North for one third.
96,402.—GRINDER FOR HARVESTER-CUTTERS.—W. B. Deuel, Ithaca, N. Y.
96,403.—MACHINE FOR THREADING BOLTS.—C. E. De Valin, Baltimore, Md.
96,404.—PROPELLING SMALL BOATS.—Virgil Dresser, Leavenworth, Kansas.
96,405.—PROCESS OF RESTORING AND PRESERVING DECAYING RAILROAD TIES.—William Dripps, Coatesville, Pa.
96,406.—SHAFT COUPLING.—W. P. Dugdale, Goshen, Ind. Antedated Oct. 30, 1869.
96,407.—STEP FOR VERTICAL SPINDLE.—B. F. Dunklee, Concord, N. H., assignor to A. S. Gear, New Haven, Conn.
96,408.—LIFTING JACK.—J. H. Edward, Polo, Ill. Antedated Oct. 22, 1869.
96,409.—PROCESS OF PRODUCING CARBON PIGMENTS.—Alonzo Farrar, Boston, Mass.
96,410.—TAG.—S. B. Fay, New York city.
96,411.—SELF-SUPPORTING FENCE.—Thomas Flinn, Birmingham, Pa.
96,412.—SOLES OF RUBBER BOOTS AND SHOES.—Francis Flynn, Woonsocket, R. I.
96,413.—WASHING MACHINE.—L. P. Follett, Clifton Springs, N. Y.
96,414.—BUT-HINGE.—C. H. Foster, San Francisco, Cal.
96,415.—INSTRUMENT FOR CONVEYING MEDICINE TO DISEASED PARTS.—P. J. Frank, Ashford, N. Y.
96,416.—AX.—Joseph Franklin (assignor to himself and Joseph Whitely), Springfield, Ohio.
96,417.—SNAP HOOK.—R. L. Fraser, Westernville, N. Y.
96,418.—SNAP HOOK.—R. L. Fraser, Westernville, N. Y.
96,419.—MECHANICAL MOVEMENT.—D'Alembert T. Gale, Poughkeepsie, N. Y.
96,420.—BASE BURNING COOKING RANGE.—J. B. Gardner, New York city.
96,421.—TOBACCO PRIZE.—C. T. Gilmor, Baltimore, Md.
96,422.—TOBACCO PRESS.—C. T. Gilmor, Baltimore, Md.
96,423.—RENDERING ANIMAL FAT.—H. E. Gotleb, New York city, assignor to Henry Winslow.
96,424.—METALLIC FRAME FOR MUSIC STAND.—William M. Greenwood and Benoit Roux (assignors to M. Greenwood & Co.), Cincinnati, Ohio.
96,425.—HORSE HAY RAKE.—P. M. Gundlack, Belleville, Ill.
96,426.—TOOL POST.—Fayette Hardenbergh, Providence, R. I.
96,427.—OIL CUP FOR MOVABLE BEARINGS.—Dennis Harrigan, Somerville, assignor to John W. Wiggins, Boston, Mass.
96,428.—RAILWAY SUPPLY APPARATUS.—David Harrison, Fayette, Miss.
96,429.—COOKING STOVE.—Charles W. Hermance, Schuylerville N. Y.
96,430.—CHIMNEY COWL.—Edward Hewett, St. Leonard's-on-sea, England.
96,431.—METAL SLEIGH RUNNER.—Daniel Holdiman, Waterloo, Iowa.
96,432.—TURBINE WATER WHEEL.—D. O. Holman, Adams, N. Y.
96,433.—WOODEN PAVEMENT.—Lawrence Holms, Paterson, N. J.
96,434.—CARRIAGE SEAT.—Gilbert L. Hudson, Romeo, Mich.
96,435.—FENCE.—George W. Hunter, Versailles, Ind.
96,436.—GATE.—John H. Hunter, Versailles, Ind.
96,437.—SALVE.—Theodore Jarvis, New York city.
96,438.—METHOD OF UNITING ARTIFICIAL TEETH ON RUBBER BASES TO METALLIC PLATES.—Elijah K. Jenner, Healdsburg, Cal.
96,439.—HULLING MACHINE.—Charles Jordan, East Bridgewater, Mass.
96,440.—TIN CAN.—Roswell Judson and John P. Schenck, Jr., Matteawan, N. Y.
96,441.—GAS BURNER.—Wesley L. Jukes (assignor to himself, Frederick McLewee, Prentice H. Putnam, and Bronson Murray), New York city.
96,442.—CASE AND SAMPLE CARD FOR SPOOLED SILK, ETC.—Wm. G. Kelly, Oneida, N. Y.
96,443.—STILT.—Lewis A. Kimberly, New Haven, Conn.
96,444.—SHINGLE MACHINE.—Samuel M. King, Lancaster, Pa.
96,445.—COPY HOLDER FOR PRINTERS.—Horace W. Knight, Seneca Falls, N. Y.
96,446.—SPRING BED BOTTOM.—F. F. Lahm, Chicago, Ill.
96,447.—SCREW CAP FOR CAN.—Alexander N. Lapierre, New York city.
96,448.—MACHINE FOR MAKING HOOPS.—Wm. Lawyer, Macomb, N. Y.
96,449.—COMPOUND WHEEL AND AXLE.—Benjamin F. Leet, Dayton, Nevada.
96,450.—SAWING MACHINE.—Joseph F. Lettellier and Adolph Leitelt, Grand Rapids, Mich.
96,451.—CLAMP FOR BUTTER FIRKINS.—D. M. Lockridge, Otto, N. Y.
96,452.—SHOE FOR CRIPPLES.—Henry S. Loper (assignor to himself and Henry S. Parsons), New Haven, Conn.
96,453.—LEATHER PUNCH.—John Lyle, Newark, N. J.
96,454.—WATER WHEEL.—Myron H. Matson, Horseheads, N. Y.
96,455.—PACKING AUGER AND SPIRAL CONVEYER.—J. Mattison, Oswego, N. Y.
96,456.—TRUSS.—G. Mayer, Sullivan, Ill.
96,457.—HORSE-POWER ENGINE FOR EXTINGUISHING FIRES.—John C. McCarthy, New York city.
96,458.—MACHINE FOR MAKING CHAIR SEATS.—Joseph C McCormick (assignor to himself and George Stiteler, Smicksburg, Pa.
96,459.—BAG TIE.—John C. Meloy, Hastings, Minn. Antedated October 23, 1869.
96,460.—RECTUM SUPPORTER.—Samuel P. Mervine, Jr., Philadelphia, Pa., assignor to himself and W. W. Lower, Washington, D. C.
96,461.—CARPET-BEATING MACHINE.—Loran Miner, San Francisco Cal.
96,462.—HAY LOADER.—Benjamin J. Moore, Dresbach, Minn.
96,463.—STEAM ENGINE PULPET VALVE.—George F. Morse, Portland, Me.
96,464.—IMPLEMENT FOR DESTROYING QUACK GRASS.—Chas. W. Moseley, Onondaga, N. Y.
96,465.—COMPOUND FOR PRIMING ELECTRIC FUSES.—George M. Mowbray, Titusville, Pa.
96,466.—VELOCIPEDE.—Bernard H. Muehle (assignor to himself and Nicholas Jones), Buffalo, N. Y. Antedated October 30, 1869.
96,467.—LATHE BATH AND SPONGE HOLDER FOR DENTISTS' USE.—D. Murliess, Holyoke, Mass.
96,468.—PLANT PROTECTOR.—H. K. Nelson, Penn Yan, N. Y.
96,469.—MOLD FOR WELDING STEEL TO IRON.—George Nock, New Monmouth, N. J., assignor to himself and Zadock Street, Salem, Ohio.
96,470.—DOOR SPRING.—E. D. Norton, Cuba, N. Y.
96,471.—APPARATUS FOR DRYING LUMBER.—F. I. Norton, Fremont, Ohio.
96,472.—APPARATUS FOR THE DISCHARGE AND PREPARATION OF GRANULAR ORE AND COAL, AND SIMILAR MATERIALS.—Peter Osterspey, Mechernich, Prussia, assignor to Adolphus Meier & Co., St. Louis, Mo.
96,473.—WASH BOILER.—H. Packer and G. W. Packer, Sandwich, Ill.
96,474.—HORSE HAY FORK.—James A. Park, Lansing, Mich., assignor to himself and Wm. Woodhouse.
96,475.—PUMP.—A. N. Parkhurst, Knoxville, Ill.
96,476.—SMUT MILL.—Daniel Pease, Floyd, N. Y.
96,477.—MODE OF PURIFYING RANCID BUTTER.—Calvin Peck, Marshall Ill.
96,478.—CUT-OFF FOR PIPES.—James H. Perkins, Omaha, Nebraska.
96,479.—MELTING AND DECARBONIZING IRON.—Chas. Peters, Trenton, N. J.
96,480.—PRINTING PRESS.—James N. Phelps, Brooklyn, N. Y., signor to himself and Joseph Bayley, New York city.
96,481.—DUMPING CAR FOR GRADING.—William Price, Cincinnati, Ohio.
96,482.—DEVICE FOR REMOVING DUST FROM THRESHING MACHINES.—Era Rose, Vernon, Ind.
96,483.—APPARATUS FOR TURNING THE LEAVES OF MUSIC.—Isaac M. Ross, Petersburg, Ind.
96,484.—SHOVEL AND TONGS STAND.—Benoit Roux (assignor to M. Greenwood & Co.), Cincinnati, Ohio.
96,485.—COAL STOVE.—George D. Sanford, Peekskill, N. Y. Antedated May 2, 1869.
96,486.—WATER COOLER AND REFRIGERATOR.—Charles C. Savery, Philadelphia, Pa.
96,487.—BREAD AND CAKE RECEPTACLE.—Charles C. Savery (assignor to Barrows, Savery & Co.), Philadelphia, Pa.
96,488.—ELECTRO-MAGNETIC GAS-LIGHTING APPARATUS.—A. W. Scharit, St. Louis, Mo., L. A. Hudson, Syracuse, N. Y., and Darius Lyman, Parkman, Ohio.
96,489.—ICE CREAM FREEZER.—Paul Schumacher, New York city.
96,490.—FRUIT JAR.—H. E. Shaffer, Rochester, N. Y.
96,491.—PAPER COLLAR MACHINE.—Samuel Shepherd, Nashua N. H.
96,492.—MACHINE FOR PUNCHING METALS.—H. A. Shipp, London, England, assignor to himself and Abner A. Griffing, New York city.
96,493.—DOOR SPRING.—Joseph Simpson, Newark, Ohio.
96,494.—DRAFT REGULATOR.—James J. Smith, and Samuel Wood, Cleveland, Ohio.
96,495.—LADDER.—Martin Luther Smith, Battle Creek, Mich.
96,496.—CATARRH REMEDY.—John Snow, Grand Rapids, Mich.
96,497.—COOKING STOVE.—Asa Snyder, Richmond, Va.
96,498.—RAILROAD CAR HEATER.—Frank J. Steinhauser and Henry M. Shreiner, Lancaster, Pa.
96,499.—BALANCE SLIDE VALVE.—William M. Stevenson, Sharon, Pa.
96,500.—CATTLE CAR.—Zadok Street, Salem, Ohio.
96,501.—RAILROAD CAR VENTILATOR.—Overton J. Styner and John Egan, LaFayette, Ind.
96,502.—WHEEL.—Edwin Swasey, Milford, Mass.
96,503.—HARVESTER CUTTER.—J. M. Taft, Arcadia, Wis.
96,504.—CAR SEAT.—A. D. Tate, Peekskill, N. Y.
96,505.—BITSTOCK.—O. H. Taylor, Brooklyn, N. Y. Antedated Oct. 23, 1869.
96,506.—BUTTER PACKAGE.—J. Thayer, Palmyra, Wis.
96,507.—WINDOW.—Levi Till (assignor to himself, B. W. Wells, and J. C. Butler), Sandusky, Ohio.
96,508.—HAND STAMP.—J. C. Tone and H. A. Clum (assignors to T. W. Tone), Rochester, N. Y.
96,509.—CULINARY BOILER.—J. S. Totten, Lebanon, Ohio.
96,510.—CORN AND FERTILIZER DROPPER.—A. Towberman and John Keys, Washington, Ill.
96,511.—CLOTHES WRINGER.—Ambrose Tower, New York City.
96,512.—WASHBOARD AND WRINGER FRAME.—A. Tower, New York city.
96,513.—LAND ROLLER.—E. A. Uehling, Richwood, Wis.
96,514.—CAR COUPLING.—M. Van Slyke and D. W. Wood, Rome N. Y.
96,615.—WOOD PULPING MACHINE.—Heinrich Voelter, Heidenheim, Wurtemberg.
96,516.—BROOM AND BRUSH HOLDER.—B. D. Wallace, Boston, Mass.
96,517.—HAY FORK.—E. W. Walton and A. J. Brown (assignors to Matteson & Williamson), Stockton, Cal.
96,518.—STEAM CULINARY VESSEL.—Cyrus Waterman, Providence, R. I.
96,519.—FAUCET.—William Weaver, Nashua N. H.
96,520.—WEIGHING SCALE.—John Weeks, Buffalo, N. Y., assignor to himself and Buffalo and Niagara Scale Works.
96,521.—BALE-TIE LOCK.—Jay Wheelock, San Francisco, Cal.
96,522.—WATER-WHEEL GOVERNOR.—J. A. Whitman, Auburn, Me.
96,523.—ORNAMENTAL COVERING FOR FLOORS, WALLS, ETC.—Henry Whittemore, New York city.
96,524.—PROCESS OF REFINING THE WASTE FROM GERMAN SILVER AND OTHER METALS.—Frederick Wilcox, Waterbury, assignor to H. B. Wilcox, Portland, Conn. Antedated Oct. 29, 1869.
96,525.—PROCESS OF UTILIZING THE WASTE FORMED IN CLEANING COPPER AND BRASS GOODS.—Frederick Wilcox, Waterbury, assignor to H. B. Wilcox, Portland, Conn. Antedated October 29, 1869.
96,526.—PASSENGER REGISTER FOR STREET CARS.—W. W. Willis, Chicago, Ill. Antedated Oct. 30, 1869.
96,527.—OILER HOLDER FOR SEWING MACHINE.—A. Wilmot, Cleveland, Ohio.
96,528.—SHAMPOOING APPARATUS.—M. L. Winn, San Francisco, Cal.
96,529.—SLEIGH BRAKE.—Judson Wolfe and Wilson Wolfe, Harveyville, Pa.
96,530.—RIBBON CASE.—George F. Woolston, Marshalltown, Iowa.
96,531.—KNITTING MACHINE.—Henry C. Work, Philadelphia, Pa.
96,532.—FIRE KINDLER.—J. A. Fuller, Rockford, Ill.
96,533.—EXTENSION TABLE SLIDE.—Albert H. Shipman, Arcadia, N. Y.

REISSUES.

11,711.—CALENDAR CLOCK.—Dated Sept. 19, 1854; extended seven years; reissue 3,694.—William H. Akins and Joseph C. Burritt, Ithaca, N. Y.
44,273.—CORN PLANTER.—Dated Sept. 20, 1864; reissue 3,695.—J. Armstrong, Jr., Elmira, Ill.
Design 2,792.—TRADE MARK.—Dated Oct. 1, 1867; reissue 3,696.—Thos. Bakewell, Pittsburgh, Pa.
88,111.—AUXILIARY TABLE.—Dated March 22, 1869; reissue 3,697.—James Blake and George Blake, Scranton, Pa., assignees of James Blake.
75,623.—EGG CARRIER.—Dated March 17, 1868; reissue 3,698.—A. H. Bryant, Philadelphia, Pa.
81,059.—BREECH-LOADING FIRE-ARM.—Dated Aug. 11, 1868; reissue 3,699.—Bethel Burton, Brooklyn, and W. G. Ward, New York city, assignees of Bethel Burton.
86,661.—HORSE HAY FORK.—Dated Feb. 9 1869; reissue 3,700.—Elliott P. Gleason, New York city, assignee of Benjamin F. Gladding.
94,689.—ROOFING.—Dated Sept. 7, 1869; reissue 3,701.—R. K. Kille, Mount Holly, N. J.
79,981.—PRESS AND STRAINER.—Dated June 16, 1868; reissue 3,702.—J. H. Littlefield, Cambridge, Mass.
94,365.—DRESSING SAW TEETH.—Dated Nov. 24, 1868; reissue 3,703.—John Lough, Buckingham village, Quebec.
83,401.—STOVEPIPE ELBOW.—Dated Oct. 27, 1868; reissue 3,704.—H. B. Morrison, for himself, and C. L. Morrison, assignee, by mesne assignments, of H. B. Morrison, Le Roy, N. Y.
34,316.—PLOW COUPLING.—Dated Feb. 4, 1862; reissue 1,598, Dated Jan. 5, 1864; reissue 3,705.—Geo. Owen, Jacksonville, Ill.
90,333.—COMPOSITION FOR STUFFING LEATHER.—Dated May 25, 1869; reissue 3,706.—Division 1.—Samuel B. Pierce, Samuel S. Johnson, Robert Andrews, and R. N. Austin, Milwaukee, Wis., assignees of Robert Andrews.
90,333.—PROCESS OF TREATING TAR FOR THE MANUFACTURE OF STUFFING FOR LEATHER.—Dated May 25, 1869; reissue 3,707.—Division 2.—S. B. Pierce, S. S. Johnson, Robert Andrews, and R. N. Austin, Milwaukee, Wis., assignees of Robert Andrews.
60,938.—PLOW.—Dated Jan. 1, 1867; reissue 3,708.—F. F. Reynolds, Bethany, for himself, and J. H. Hines, Davisborough, Ga., assignee of F. F. Reynolds.
32,255.—MODE OF MAKING THE SKEINS OF AXLE ARMS FOR CARRIAGES.—Dated May 7, 1861; reissue 3,709.—Gottlieb Schreyer, Columbus, Ohio.
74,252.—FRUIT FRAME.—Dated Feb. 11, 1868; reissue 3,710.—Chester Stone, Ravenna, Ohio.
25,992.—APPARATUS FOR COOLING BEER AND OTHER LIQUIDS.—Dated Nov. 1, 1859; antedated April 18, 1856; reissue 1,267, dated Jan. 28, 1862; reissue 3,711.—G. L. Turrell, New York city, assignee, by mesne assignments, of J. L. Baudelot.
75,500.—DEVICE FOR WEAVING CHAIR SEATS.—Dated March 10, 1868; reissue 3,712.—G. A. Watkins, Proctorsville, Vt.

DESIGNS.

3,731.—PLATE OF A STOVE.—S. W. Gibbs, Albany, N. Y.
3,732.—DOOR KNOB AND ITS ROSE.—Wm. Gorman (assignor to the Russell & Erwin Manufacturing Co.), New Britain, Conn.
3,733.—BUT HINGE.—Wm. Gorman (assignor to the Russell & Erwin Manufacturing Co.), New Britain, Conn.
3,734.—RACK PULLEY.—C. F. Hager, Buffalo, N. Y.
3,735 and 3,736.—STOVE.—Conrad Harris and P. W. Zoiner, Cincinnati, Ohio. Two patents.
3,737.—CYLINDER STOVE.—Conrad Harris and P. W. Zoiner, Cincinnati, Ohio.
3,738.—Suspended.
3,739.—ORNAMENTAL BRIDLE BIT.—Louis Rommeiks, Newark, N. J.
3,740.—COOK STOVE.—N. S. Vedder and Francis Ritchie (assignors to G. H. Phillips & Co.), Troy, N. Y.
3,741.—TRUNK COVER.—N. B. Williams, New York city.

EXTENSIONS.

REFRIGERATORS.—D. W. C. Sanford, of New Orleans, La.—Letters Patent No. 13,802, dated Nov. 13, 1855; reissue No. 455, dated April 31, 1857.
SEWING MACHINE.—L. W. Langdon, of Northampton, Mass. Letters Patent No. 13,727, dated Oct. 30, 1855.
ROOFING COMPOSITION.—Jas. West, of Syracuse, N. Y.—Letters Patent No. 13,783, dated Oct. 30, 1855; reissue No. 491, dated September 8, 1857.

Inventions Patented in England by Americans.

[Compiled from the "Journal of the Commissioners of Patents."]

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2,903.—PERMANENT WAY OF RAILWAYS.—D. R. Pratt, Worcester, Mass. October 6, 1869.
2,903.—WASHING MACHINE.—Wm. Hewes, Toronto, Canada. October 6, 1869.
2,917.—PARLOR SKATES.—W. P. Gregg, Boston, Mass. Oct. 7, 1869.
2,928.—APPARATUS FOR DISTILLING POTABLE WATER.—H. Wainwright New York city. October 8, 1869.
2,997.—RAILWAY CARRIAGE WHEEL.—Z. Washburne, of the State of Massachusetts. October 14, 1869.
3,006.—CHAIN-CABLE STOPPER.—J. J. Emery, South Thomaston, and P Thurston, Rockland, Me. October 15, 1869.
3,025.—MANUFACTURE OF IRON AND STEEL.—J. Player, Philadelphia, Pa October 16, 1869.

APPLICATIONS FOR EXTENSION OF PATENTS.

ECCENTRIC EXPLOSIVE SHELLS.—Wm. W. Hubbell, of Philadelphia, Pa., has applied for an extension of the above patent. Day of hearing Jan. 3 1870.
MACHINES FOR CUTTING FLOCKS AND PAPER STOCK.—J. N. Pitts, Blackstone, Mass., has applied for an extension of the above patent. Day of hearing January 10, 1870.
APPARATUS FOR HEATING BUILDINGS BY STEAM.—Stephen J. Gold, of West Cornwall, Conn., has petitioned for an extension of the above patent. Day of hearing Jan. 12, 1869.

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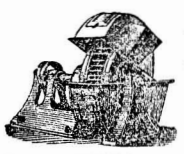

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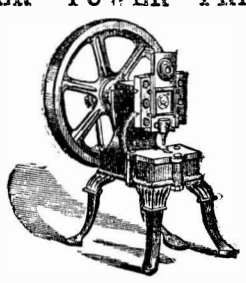

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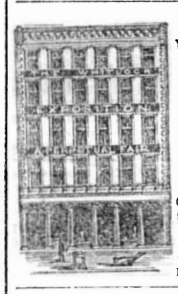

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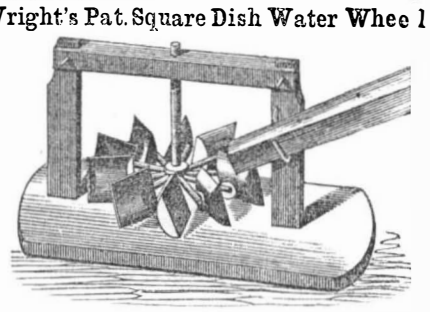

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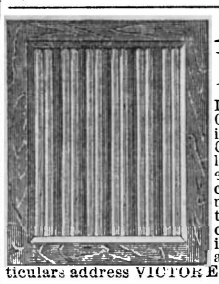

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